

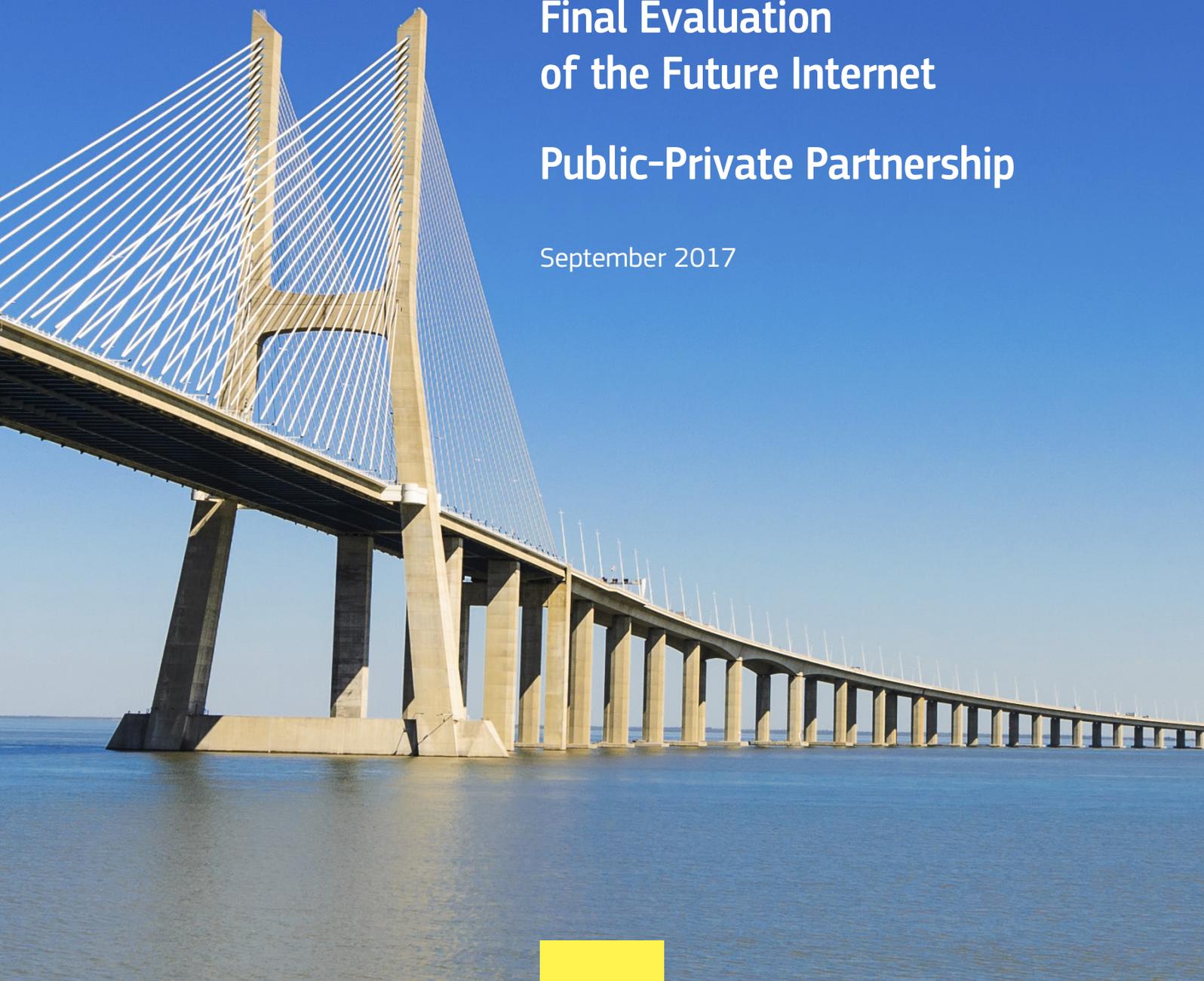


Breaking the Mould: A New Model for EU Innovation Programmes

Final Evaluation
of the Future Internet

Public-Private Partnership

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Breaking the Mould: A New Model for EU Innovation Programmes

Final Evaluation of the Future Internet Public-Private Partnership

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Executive Summary

The Future Internet Public-Private Partnership was a six-year effort to advance Europe's competitiveness in smart, data-driven solutions and services, and to support the emergence of innovative digital applications of public and social relevance.

This Final Evaluation Report assesses the progress made within the FI-PPP since the Second Interim Assessment in 2014 and presents an overall assessment of the Programme since its launch in 2011. The report covers the evolution from a research programme, FI-PPP, to an open platform and brand, FIWARE that is aiming to be the basis of an innovation ecosystem. It addresses, in particular, the ground-breaking implementation measures used under Phase 3 and the prospects for sustainability of the results post-EU funding.

Breaking the Mould: A New Model for EU RDI Programmes

The FI-PPP was not a business-as-usual technology development programme, comprising of independent research projects: it represented a new model for European research, development and innovation (RDI) initiatives in mainstreaming innovation within the digital sphere and more generally. In many respects, the FI-PPP has broken the mould in terms of what an EU RDI programme can be and how it should be run. Innovation and flexibility were hallmarks of the Programme throughout. This is reflected in the notable successes achieved at both strategic level (what was delivered) and operational level (how it was delivered). Its results are already being taken up within markets worldwide, while its implementation demonstrated a flexibility of mind that is unusual in EU circles and did much to gain the confidence of business and investor stakeholders.

The goals of the FI-PPP remain highly relevant for Europe and the Programme represents significant net business value for the investment made. Headline figures relating to the Programme's achievements are summarised in Box A.

Box A: FIWARE Achievements in Figures

- **450 FTEs** across Europe employed within the FI-PPP between 2011 and 2016
 - **€100m** leveraged from direct financial contributions to FI-PPP projects
 - **52 software components** ('enablers') listed in the final FIWARE Catalogue
- around **8300 proposals** for grant funding submitted across a total of **31 calls** by Phase 3 accelerators
- **1047 applications** ('sub-grantees') funded, each receiving on average around **€75k support** for developing FIWARE-based solutions and apps
 - around **110 organisations** worked together across **16 accelerators** to support sub-grantees
 - **€85M in external investments** received into FIWARE sub-grantees (to date)

The impact of the Programme is already tangible and further benefits can be expected in the future. The EU invested around €300m in the FI-PPP which in turn has leveraged a further €100m of direct financial contributions. Less than twelve months since the Programme officially concluded, external investments into FIWARE sub-grantees has exceeded €80m, matching the initial investment made in the Accelerator Programme. The fact that market-savvy investors continue to back FIWARE with their own money attests to growing market confidence in the technology and its prospects.

The ground-breaking nature of the FI-PPP offers important lessons for the mission-oriented, impact-focused approach foreseen under FP9. For example, the importance of strong leadership and governance, the need for a selection process that allows for a portfolio approach, and the challenge of securing both the engagement of large corporates to act as anchors while also maintaining a major role for new and disruptive innovators are all issues highlighted here. FI-PPP also provides a valuable vanguard experience in planning for the innovation pillar of FP9, with its

emphasis on engagement with start-up and scale-up businesses. These and other aspects we highlight as ‘Learning Points’.

Programme Achievements and Outcomes

From a strategic perspective, the Panel considers the main outcomes from this six-year effort to be:

- An **open service platform with distinctive technological advantages** and the credibility to compete in global markets.
- A valuable body of results in **key application sectors** accumulated through the Use Cases and Large-Scale Trials.
- A ground-breaking experiment in using a **Europe-wide network of innovation accelerators and hubs to support SMEs, start-ups and entrepreneurs in using these technologies**, together with a substantive body of knowledge on good accelerator practices accumulated during this process.
- The **commitment of several major industry players** willing to embrace FIWARE and champion it within key market sectors. However, given the critical role of major industry players to the success of FIWARE, further efforts in this direction are required.
- **An evolving ecosystem** of large companies, SMEs, developers, start-ups and users that is sufficiently committed to FIWARE to have formed an independent foundation to be custodian of the technology and community. This ecosystem is still embryonic, however, and has yet to reach critical mass.
- **Commercial reference deployments of FIWARE-based solutions are beginning worldwide** across many sectors, with an especially prominent and promising position within the Smart City market.
- Increasing **recognition of the merits and advantages of FIWARE** within various forums worldwide, including adoption of the FIWARE platform as a de facto standard in key applications. Pragmatic and valuable efforts have been made to capitalise on this which are being taken forward by the newly-formed FIWARE Foundation.

The creation of the independent FIWARE Foundation to take ownership of the technology and move it forward is an extremely positive development that bodes well for the future. The Foundation has made a credible start but faces many challenges in terms of sustainability and future growth, and in retaining and enlarging the open approach that has contributed to FIWARE’s success thus far.

Programme Implementation

The FI-PPP was conceived as a fully integrated programme, where activities would be implemented in a highly coordinated way. This programmatic approach was largely successful, as demonstrated by the scale and scope of the achievements listed above. However, difficulties were encountered in certain areas that led to the implementation being sub-optimal from the programme point of view. The Panel highlights the following as areas where the programme approach was not fully effective and where lessons may be learned for the future:

- Reliance on traditional instruments constrained the ability to select projects according to overall programme requirements. Alternate mechanisms are needed that allow the programme view to be enforced more effectively at the project selection stage.
- A geographical imbalance in the selection and funding of sub-grantees. This partially reflected national circumstances (applicants compensating for weak capital markets in some countries). Nevertheless, a more equitable distribution of funding should have been sought.
- The Large Scale Trials were not sufficiently integrated within the Programme and their impact has been limited. This restricted the Programme’s articulation into traditional sectors, such as energy, healthcare, manufacturing and logistics, which could benefit

substantially from FIWARE. Action is needed to re-engage the LSTs and, to the extent that they still have value, exploit their results.

- The infrastructure projects INFINITY and XIFI, as well as the networking project iHubs, were largely ineffective and have left little by way of legacy. Under future initiatives such horizontal activities should be better defined.

In addition, the Panel finds that:

- Ineffective governance during the early stages led to drift and inefficiency that had significant knock-on effects in terms of the Programme's efficiency and coherence.
- Quality assurance of the FIWARE platform has helped build market credibility but should have been addressed earlier. Insufficient progress was made on this issue during Phase 3 and quality management remains a concern.
- Sustainability planning was not addressed with sufficient urgency and lacked appropriate coordination, leading to unnecessary delays in establishing the Foundation.
- The lack of on-going monitoring, *ex-post*, is hindering a longer term view of the Programme's achievements and impacts.

Specific findings in relation to performance under Phase 3, the latest and final phase, are summarised in Box B.

Box B: FI-PPP Performance under Phase 3

In relation to Phase 3, the Panel highlights specifically:

- The Accelerator Programme was a valuable and highly innovative experiment. The diversity of models and approaches employed has provided a valuable knowledge base for future initiatives of this kind.
- The sub-granting process was well implemented, attracting high quality applicants across the EU and beyond. It offered SMEs and start-ups favourable terms compared to what is available on the open market.
- The Large-Scale Trials had limited visibility during Phase 3 and were not sufficiently supportive of the Accelerator Programme; in general their follow up has been weak.
- The Programme Support Actions generally performed well and generated useful insights and tools, but their experiences are not being fully exploited.
- Communications activities were of a very high standard for a European RDI programme but the messages were not sufficiently focused in business terms.
- Many Phase 3 beneficiaries continue to perform strongly and some have received additional investment. Furthermore, beneficiaries show a strong bias towards B2B markets, which is well aligned with future business opportunities.
- Phase 3 provided a valuable screening mechanism for professional investors to have new and untried FIWARE applications and technologies trialled for them.

Programme Innovation

Many innovations were introduced under the FI-PPP in terms of how the programme was implemented and managed. These included:

- Use of independent technical experts to certify the quality of the FIWARE components and their reference implementations, which has helped to build credibility in the marketplace.
- A highly professional approach to communications that helped to present a unified view of the Programme to the outside world.
- A highly-innovative Accelerator Programme that created a real-life laboratory around FIWARE.
- A 'VIP Programme' that provided focused support to a small number of start-ups identified as having high potential for market success.

- Use of independent experts to act as mentors to the individual accelerators, as well as helping to share experiences across the Accelerator Programme.
- Dedicated efforts to promote the technology at global level from an early stage, which were eventually brought together under a distinctive FIWARE Mundus brand.
- Creation of the independent FIWARE Foundation.

These process innovations provide important lessons for EU RDI programmes going forward.

A Promising Future

FIWARE is well positioned for the next wave of the Digitisation Revolution. As an open platform for smart solution development, FIWARE offers an attractive environment for connecting value chains in traditional industries that have been largely untouched by digitisation up to now. This presents major opportunities for innovative SMEs and start-ups in the digital sector, where FIWARE's royalty-free, open source, multi-vendor approach reduces the risk of dominance by global players offering proprietary systems.

Although the funded programme has come to an end, there are still many avenues open to stakeholders in exploiting the FIWARE results and ensuring sustainability over the medium to long term. While much of this is now within the remit of the Foundation, other stakeholders – including the European Commission – have important contributions to make in shaping the landscape and nurturing the FIWARE ecosystem.

Our Recommendations (summarised in the table) primarily address four key challenges:

- 1) **Mobilising support from large companies:** Engaging with large players, both suppliers and end-users, as gateways into new markets, and to help secure the financial sustainability of the Foundation and support start-ups in using FIWARE through corporate venturing.
- 2) **Re-engaging sectoral communities and stakeholders:** Re-engaging with the sectoral communities established under the Large-Scale Trials in order to assist the Foundation in opening up new markets.
- 3) **Shaping a FIWARE-friendly innovation environment:** Utilising EU, national and regional programmes to encourage take-up of FIWARE-based solutions across a broad range of sectors and application domains.
- 4) **Sharing the FI-PPP experience:** Extending the monitoring and impact assessment of the Programme over the medium term, as well as capturing and disseminating the lessons from the FI-PPP for similar initiatives at European and national levels.

Summary of Recommendation	Responsible
1. Mobilise large companies as gateways into new markets	FIWARE Foundation
2. Re-engage with sectoral communities and stakeholders, in particular those under the LSTs	FIWARE Foundation; European Commission
3. Enhance the FIWARE quality assurance regime and make it more transparent	FIWARE Foundation
4. Implement longer term monitoring and impact assessment of the FIWARE Programme	European Commission
5. Shape a FIWARE-friendly innovation environment, including: - Improving alignment with European programmes and policies - Promoting training, skills development & mobility of personnel - Promoting FIWARE in innovation procurement	European Commission
6. Capture and disseminate lessons for policy learning	European Commission

1. INTRODUCTION

1.1 Purpose and Scope of the Evaluation

This report presents the assessment of an independent panel of experts of the Final Evaluation of the Future Internet Public Private Partnership (FI-PPP), as required under the Commission Communication of October 2009 on *A public-private partnership on the Future Internet*.¹

The objectives of the evaluation are to:

- 1) Assess the overall achievements of the FI-PPP and in particular the progress achieved since the Second Interim Evaluation in 2014. As the final evaluation, the overall FI-PPP should be assessed, with specific attention to the planned objectives and their level of completion.
- 2) Assess the effectiveness of the sub-granting mechanism used in Phase 3 of the FI-PPP to help reach SMEs, start-ups and web entrepreneurs and to propose recommendations on the use of similar approaches in future programmes.
- 3) Evaluate the extent to which the proposals and recommendations provided during the Second Interim Evaluation have been implemented, in particular regarding how to maximise the impact of Phase 3 and follow-up of the FI-PPP after its end in 2016.
- 4) Assess the lessons learned from the FI-PPP experience and provide recommendations for action by the different stakeholders, i.e. the FIWARE Foundation, ICT industry, public sector actors, and the European Commission.

Essentially, the report covers the evolution from a research programme, FI-PPP, to an open platform and brand, FIWARE that is aiming to be the basis of an innovation ecosystem. The Panel was asked to assess this transition in the FI-PPP with respect to the following criteria:

- **Relevance:** the technological development and response of targeted industrial, research communities and innovators during the third phase of the FI-PPP Programme.
- **Quality:** of the research and innovation actions, and of the stakeholder communities associated with the programme.
- **Openness:** the communication of objectives, progress, and outcomes, and the approach and processes to open up to new users and stakeholders.
- **Effectiveness:** the approach and progress towards meeting the objectives set.
- **Efficiency:** of the management and operation of the programme.
- **Coherence:** the extent to which the programme was internally coherent, and coherent with other interventions with similar objectives.
- **EU-added value:** the additional value resulting from the EU intervention(s), compared to what could be achieved by Member States at national and/or regional levels.

It was not intended that this evaluation would consider in detail the individual projects that have been funded under the initiative, all of which have been the subject of detailed review by relevant experts. However, consideration was given to whether the portfolio of projects as a whole met the broad objectives set out for the FI-PPP.

The technological and other assets developed under the FI-PPP are now vested in the FIWARE Foundation, an independent organisation set up to nurture and grow the FIWARE technology and community. The Panel has consulted at length with the management of the FIWARE Foundation and wishes to express its gratitude for the forthright assistance provided and for the transparent nature of the discussions. Whilst much of our analysis is, we hope, pertinent and useful to the Foundation in taking FIWARE forward, we would emphasize that our work is an evaluation of the

¹ COM(2009) 479 Final.

FI-PPP Programme during the period of its European funding and is not intended to be a commentary on the current strategy of the Foundation.

The Panel's full Terms of Reference are presented in Annex 1.

1.2 Methodology

The Panel comprised experts with a broad range of expertise, including Future Internet technology and its use in modern infrastructures, research development and innovation (RDI) policy and strategy, and commercialisation. Two of the Panel members served as experts under the First Interim Assessment, while these two plus an additional expert served under the Second Interim Assessment, thus providing continuity in the assessment exercises. The Panel members are listed in Annex 2.

The Panel drew upon information provided by the European Commission (project deliverables, review reports, previous assessments, statistical data), as well as independent data sources. In addition, telephone and face-to-face interviews were undertaken with participants in the programme's constituent projects, representatives of the FIWARE community, and staff of the European Commission (see Annex 6). Time limitations prevented any meaningful direct consultations with beneficiaries of Phase 3 grants ('sub-grantees'). However, their views, experiences and opinions are well reflected in the work of the four Phase 3 support actions, in particular the monitoring reports compiled by FI-IMPACT.

The Objectives of the FI-PPP and details of its structure and implementation are presented in Section 2. This is followed by two sections that detail the findings of the Panel. Section 3 assesses implementation during Phase 3 of the FI-PPP, while Section 4 presents a wider strategic assessment of the Programme as a whole. Section 5 takes a prospective view, in terms of potential markets for FIWARE, the prospects for the FIWARE Foundation, and the role of public policy in shaping future market prospects. The Panel's Conclusions are summarised in Section 6, followed in Section 7 by recommendations for actions to leverage and/or sustain the results of the FI-PPP as well as learning points for future programmes of this nature. Points within the main text that support these forward-looking actions are cross-referenced with the notations [Recommendation] and [Learning Point] respectively.

2. BACKGROUND TO THE FI-PPP

The Future Internet Public Private Partnership (FI-PPP) Programme was an initiative launched under the European Commission's Seventh Framework Programme (FP7) and consisted of public-private research and development projects concerning the Future Internet.² Originally conceived as a European response to the fast-changing digital world of the late 2000s, the Programme assumed even greater importance in the aftermath of the economic crisis of 2008/09 and was one of a series of initiatives under the Commission's economic recovery package.³

The Programme aimed to advance Europe's competitiveness in Future Internet technologies and systems and to support the emergence of innovative Future Internet-enhanced applications of public and social relevance. It addressed the need to make public service infrastructures and business processes significantly smarter (i.e. more intelligent, more efficient, more sustainable) through tighter integration with Internet networking and computing capabilities.

The FI-PPP followed an industry-driven, holistic approach encompassing research and development (R&D) on network and communication infrastructures, devices, software, service and media technologies; and their experimentation and validation in real application contexts. Projects under the FI-PPP were required to draw upon the wealth of results already achieved through earlier European research and to valorise them further through a systematic integration with a complete system perspective. The FI-PPP brought together the demand and the supply sides, and also required the involvement of users early in the research lifecycle.

2.1 Objectives

The aims and objectives of the FI-PPP evolved during the course of the Programme. The Panel has taken as the objectives of the Programme the expected impact – over all three phases – as set out in the Work Programme 2011-2013.⁴ This may be summarised as:

- Significantly **increasing the effectiveness of business processes and novel approaches** to the operation of infrastructures and applications of high economic and/or societal value.
- Reinforcing **industrial capability** on novel service architectures and platforms.
- Providing new opportunities for **novel business models** based on cross-sector industrial partnerships built around Future Internet value chains, involving users and public authorities at local, regional and national levels, and providing SME players with opportunities to offer new products, services and applications.
- Creating **new European-scale markets for smart infrastructures** contributing to European leadership in global ICT applications markets.
- Underpinning the **evolution of Future Internet infrastructure** compatible with the emergence of an open, secure and trusted service platform.
- Providing a comprehensive approach towards **regulatory and policy issues**.

The emphasis under Phase 3 was fourfold:

- 1) To bring the FI-PPP results, i.e. FIWARE technology, closer to the market (e.g. smart cities) by consolidating the open, market-ready platform resulting from earlier phases as a standard.
- 2) To accelerate and help the SMEs, start-ups and web entrepreneurs being supported under Phase 3.
- 3) To create a European innovation ecosystem around the FIWARE technology.

² *A Public-Private Partnership on the Future Internet*, COM(2009) 479 Final

³ *A European Economic Recovery Plan*, COM(2008) 800 Final

⁴ *Future Internet Public-Private Partnership: Work Programme 2011-2013*, DG Communications Networks, Content and Technology, European Commission

- 4) To facilitate SMEs, start-ups and entrepreneurs in delivering innovative applications and services that make infrastructures and business processes significantly smarter, so as to increase added value and make public services more efficient and effective.

2.2 Legal Framework

The legal framework for the FI-PPP is unchanged from the two previous evaluations and largely builds on Special Clause 41 calling for programme coordination. The extent to which the desired programmatic approach was achieved is discussed in detail in Section 6.

Under the Terms of Reference, the Panel is requested to address one particular element of the legal framework that is only relevant under Phase 3, namely the sub-granting mechanism used to assist and reach SMEs and start-ups. Known as ‘Special Clause 42: Financial Support Given by Beneficiaries to Third Parties’, this governs the conditions under which beneficiaries of EC contracts (i.e. the accelerators) may provide financial support to third parties (i.e. SMEs, start-ups and entrepreneurs). As part of our remit, the Panel was requested to assess the effectiveness of this mechanism within the context of the FI-PPP and propose recommendations for improvement. The performance of the sub-granting process is discussed in Section 3 and related recommendations are made in Section 6.

2.3 Implementation

2.3.1 Programme Architecture

The Programme had five main building blocks:

- Technology foundation – the development of core technology components (‘enablers’) for an open platform. This work was initially undertaken in the FI-WARE project (Phases 1 & 2) and was continued under FI-CORE (Phase 3).
- Use cases and trials – to establish user requirements in end-user sectors, especially for common components. Eight Use Cases (UCs) were supported under Phase 1, followed by five Large-Scale Trials (LSTs) under Phase 2.
- Infrastructure support – making best use of existing European infrastructures (Phases 1 & 2).
- Market take-up actions – supporting SMEs, start-ups and entrepreneurs in accessing and using the technology in the development of real-world applications and services (Phase 3).
- Programme facilitation and support (all Phases).

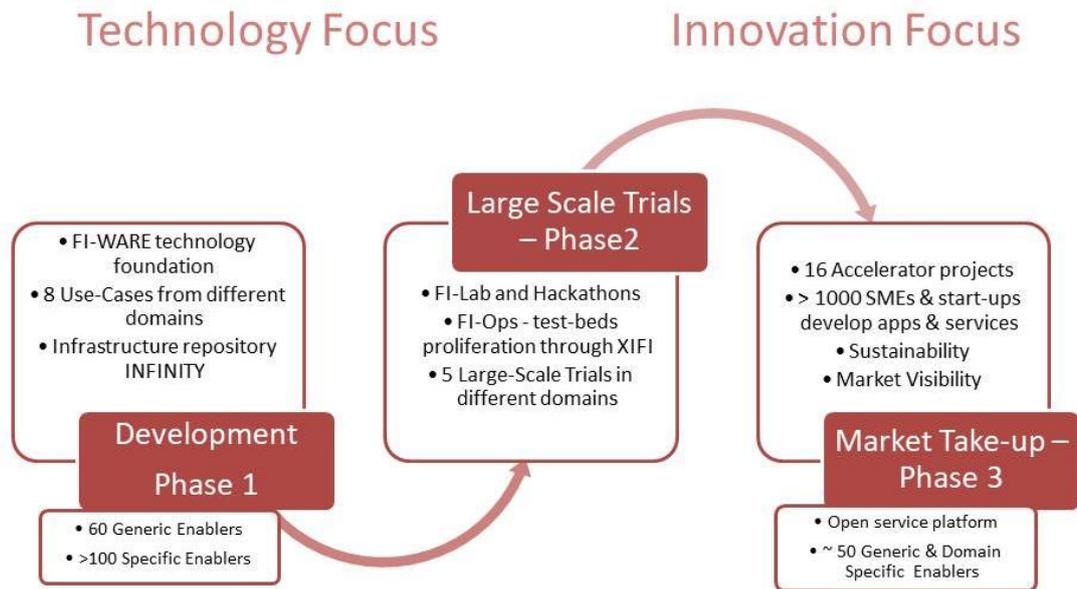
It was intended that the Use Cases and Large-Scale Trials projects should establish their various requirements for enabling technology components and that in liaison with the technology foundation projects they should agree on a set of ‘Generic Enablers’ (GEs) common to some or all of the usage areas. The technology foundation projects were to develop these and make them available to the Use Case projects as a technology suite or toolbox. In parallel, the Use Cases and Large-Scale Trials set out to develop ‘Specific Enablers’ (SEs) that they considered necessary for their domains (and shared within those domains) and then instantiate their own domain-specific platforms.

The Infrastructure activities were intended initially, in Phase 1, to identify existing and future advanced experimental infrastructures across Europe. The scope of the Phase 1 project (called INFINITY) was subsequently expanded to encompass other studies of value to the FI-PPP. XIFI, a related project launched under Phase 2, aimed to integrate, federate and upgrade existing infrastructures towards serving Large-Scale Trials.

The programme facilitation and support project (called CONCORD), funded through the whole FI-PPP, was intended to facilitate the development of an overall programme view and collaboration across all FI-PPP projects, support standardisation, SME involvement, links with regulatory and other relevant policy activities, dissemination and awareness raising. Four further Programme

Support Actions were launched under Phase 3 aimed at facilitating and measuring market growth and adoption.

Figure 2.1: The Future Internet PPP Lifecycle



2.3.2 Programme Schedule

The FI-PPP was planned to be implemented in three phases, which partially overlapped so that in some cases projects launched in earlier phases were still active later in the programme lifecycle (see Figure 2.2). The initial five-year timeframe was extended to approximately six years so that all the FI-PPP activities could conclude by the end of 2016. The content of each phase was:

Phase 1 (April 2011-March 2013)

- Define usage area requirements from which the architecture and common enablers of the core platform will be derived; start developing components.
- Start evaluation of test infrastructures and identify what must be done to bring infrastructures to the level necessary to enable trials.
- Establish the programme support and coordination structures.

Phase 2 (April 2013-September 2015)

- Ensure availability of test infrastructure for a series of Large-Scale Trials.
- Develop the core platform and use case-specific functionalities, and instantiate them on the test infrastructure.
- Select and run a series of Large-Scale Trials. Some of the trials were based on Phase 1 use cases, others were new (specifically those in health and manufacturing).
- Launch support services around the platform: FI-Ops was a suite of tools to help users to port and manage FIWARE on their own servers. FIWARE Lab (FI-Lab) was an experimentation environment ('sandbox') for developers to test out FIWARE-based applications and services.

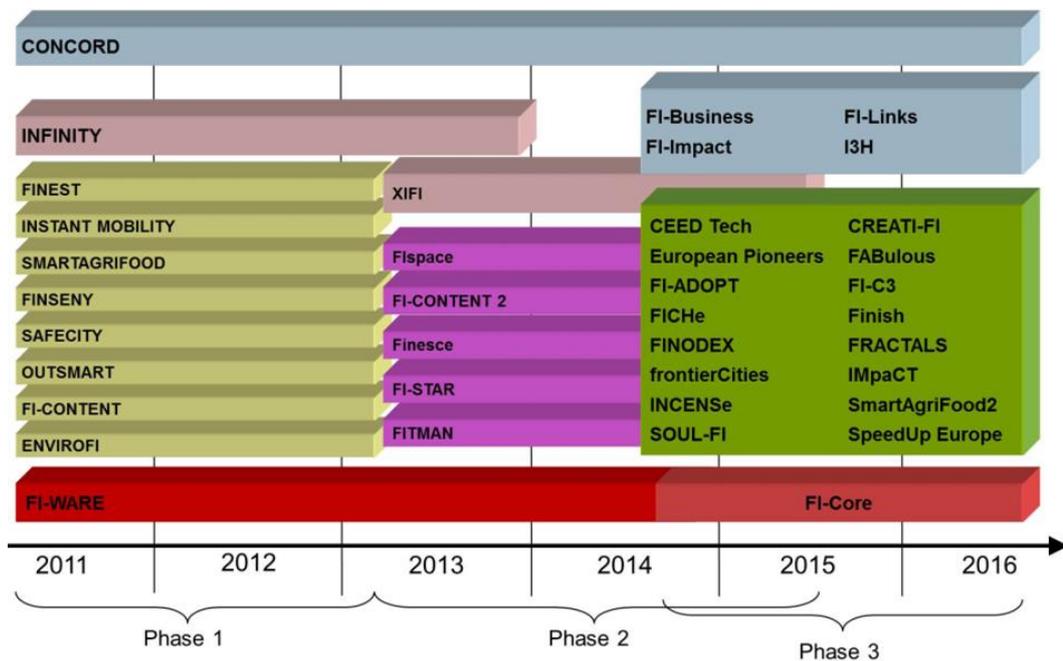
Phase 2 was originally scheduled to end in March 2015. At the request of the Commission, most of the LST projects extended their contracts by six months, to 30 September 2015, in order to guarantee support to Phase 3 accelerators and their grantees.

Phase 3 (April 2014-December 2016)

- Launch of a set of Accelerator projects, aimed at engaging and supporting SMEs, start-ups and web entrepreneurs in using FIWARE. Grants were offered for this purpose on a competitive basis through a series of open calls.
- Support and monitor the Accelerator projects through a series of Programme Support Actions that support community building and monitor impact.
- Further develop the enablers and support their adoption by the market. Activities continued under the FI-WARE project until its conclusion (midway through Phase 2) and were carried on under the FI-CORE project (Phases 2 & 3) as well as the Large-Scale Trials (Phase 2 only).

The FIWARE Acceleration Programme was the core activity of Phase 3 and was critical to the overall success of the FI-PPP. Sixteen FIWARE accelerators (sometimes referred to as the ‘A16’) were launched, following a call for proposals, with broad geographical and sectoral coverage. At least 80% of the project budget of the accelerators was reserved for open calls for SMEs, start-ups and web entrepreneurs. Accelerator projects were required to publish their open calls widely and adhere to FP7 standards with respect to evaluation, conflict of interest and confidentiality. Projects were also obliged to widely promote participation in their open calls, e.g., by tapping into venture capital communities and corporate venture activities, business angel networks, public/private accelerators and others. Applicants that were successful in the open calls (known as ‘sub-grantees’) were granted financial assistance from the A16; this was typically in the order of €50k-150k but initial seed financing in the range €10-25k was available in some accelerators. Speed and quality of service to grantees, as well as their continued and sustainable involvement, were seen as key success measures.

Figure 2.2: Timeline of the FI-PPP



The A16 were required to focus specifically on promoting take-up and use of the FIWARE technology and so differed somewhat from traditional accelerators which focus primarily on business acceleration and tend to be technology agnostic.

Under Phase 3, CONCORD continued to provide support for programme governance. In addition, four new Programme Support Actions were launched aimed at facilitating market creation, growth and adoption: FI-Business (developing and sharing best practices, and community building); FI-Links (roadmapping and building international and other linkages, later branded as FIWARE Mundus); FI-Impact (monitoring of the accelerators and impact assessment of the FI-PPP); and I3H,

subsequently rebranded as ‘the iHub network’ (aimed at mobilising a network of established digital innovation hubs beyond the FI-PPP community).

Between 2011 and 2016, around 450 full-time equivalent (FTE) posts across Europe worked within the FI-PPP, creating the kernel of a FIWARE ecosystem which is now being taken forward by the community.

2.4 Activities

The total EU budget for the FI-PPP was €300 million. Around €170 million of funding was allocated under the first two phases, with a further €130 million under Phase 3. Total budgeted project costs were €400 million including a shared-cost contribution of €100 million. The six CSA projects (CONCORD and INFINITY under Phase 1 and the four CSAs selected under Phase 3) together with the 16 accelerators were 100% funded through the EU budget (€116 million). The remaining projects were shared cost, with total project costs of €284 million (including €100 million from third-party funding).

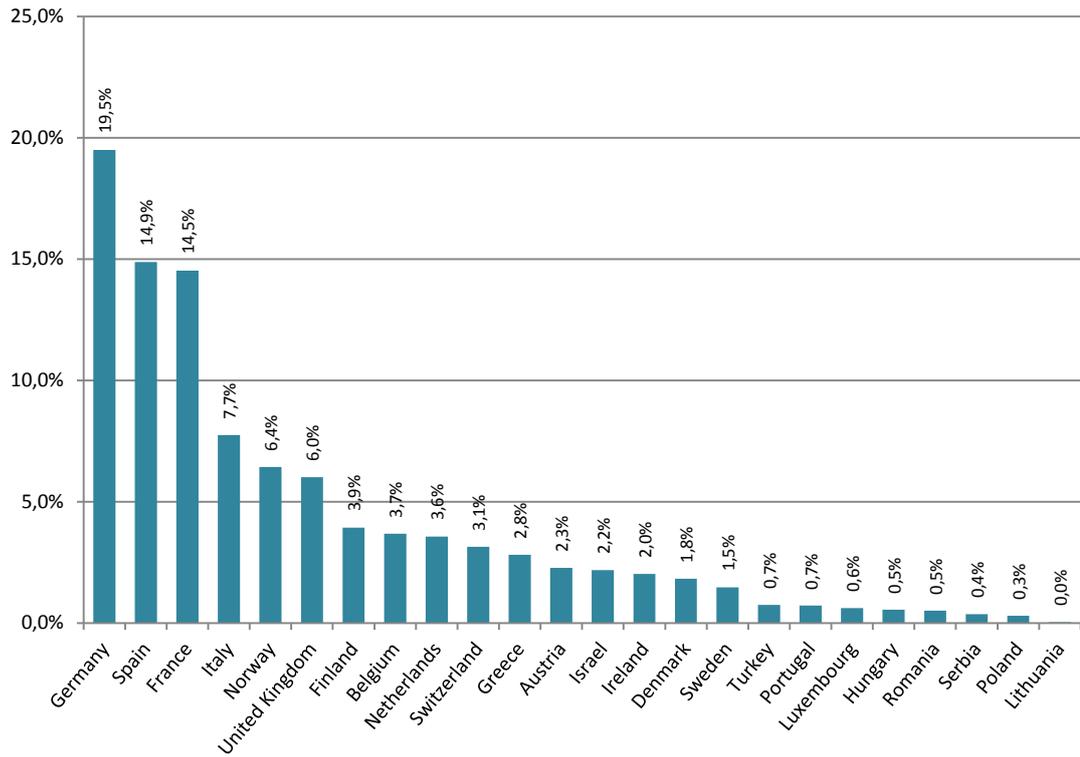
Calls for proposals for Phases 1, 2 & 3 were launched in July 2010, May 2012 and May 2013 respectively. The results are summarised in the table below. The distribution of funding by country under Phases 2 & 3 is shown in Figures 2.3 and 2.4. The relatively high ranking of Spain in Phase 3 is partly explained by it being the location of the coordinator of FI-CORE, which accounted for a significant proportion of the budget within its Call, as well as by intense promotion of the programme in Spain by national agencies. Belgium’s high ranking is partially explained by several A16 coordinators being based there (see Section 3.3. for further discussion).

The distribution of funding by country to sub-grantees (start-ups and SMEs) in Phase 3 is shown in Figure 2.5. Applicants in Spain and Italy were the biggest beneficiaries of these funds. Overall, start-ups and SMEs from 34 countries have benefitted from the sub-granting mechanism.

Table 2.1: FI-PPP Calls and Projects

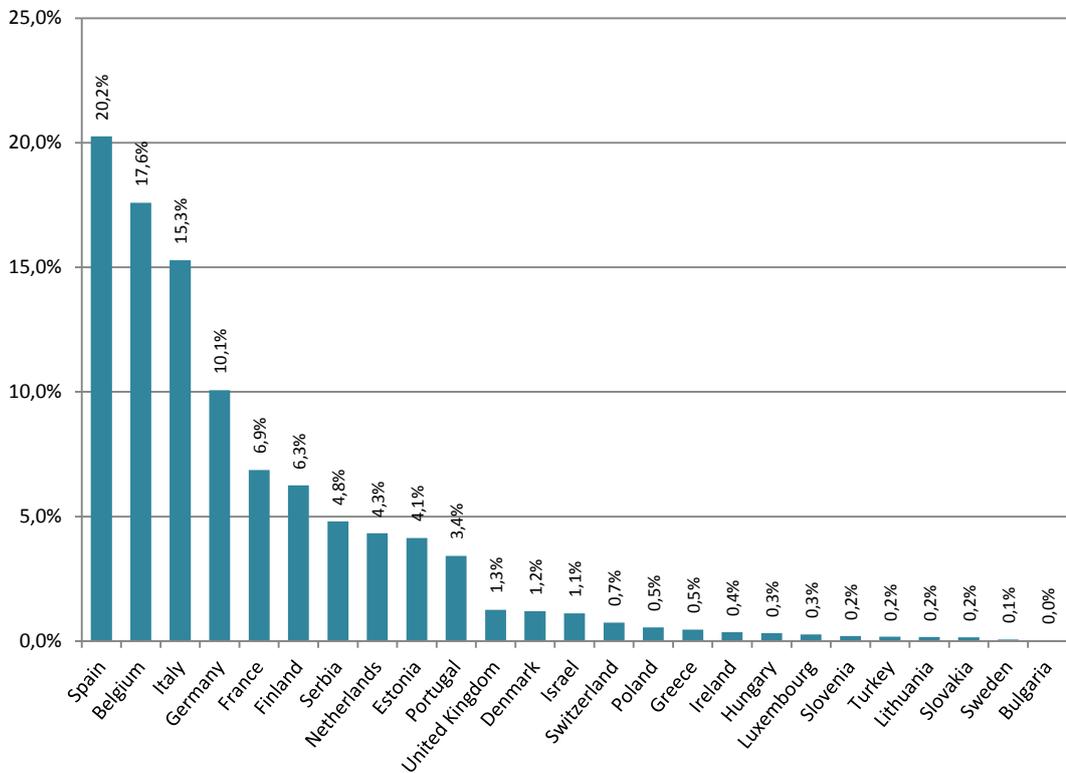
Phase	Call Closed	Call Objective	Funding	Projects Funded
Phase 1	December 2010	FI.ICT-2011.1.7 Technology foundation: Future Internet Core Platform	EUR 90M	FI-WARE (core technology)
		FI.ICT-2011.1.8 Use Case scenarios and early trials (Phase 1)		Eight Use Cases
		FI.ICT-2011.1.9 Capacity Building and Infrastructure Support (Phase 1)		INFINITY (infrastructure)
		FI.ICT-2011.1.10 Programme Facilitation and Support		CONCORD (coordination)
Phase 2	October 2012	FI.ICT-2011.1.8 Use Case scenarios and early trials (Phase 2)	EUR 80M	Five Large-Scale Trials: FITMAN (manufacturing); FINESCE (smart energy); FI-STAR (e-health); FI-CONTENT II (content); FISPACE (business collaboration). XIFI
		FI.ICT-2011.1.9 Capacity Building and Infrastructure Support (Phase 2)		
Phase 3	December 2013	FI.ICT-2013.1.8 Expansion of Use Cases	EUR 130M	16 Accelerators
		FI.ICT-2013.1.9 Technology Foundation Extension and Usage		FI-CORE plus four programme support CSAs: FI-Business; FI-Impact; FI-LINKS; I3H.

Figure 2.3: National Share of Funding Under FI-PPP Phase 2



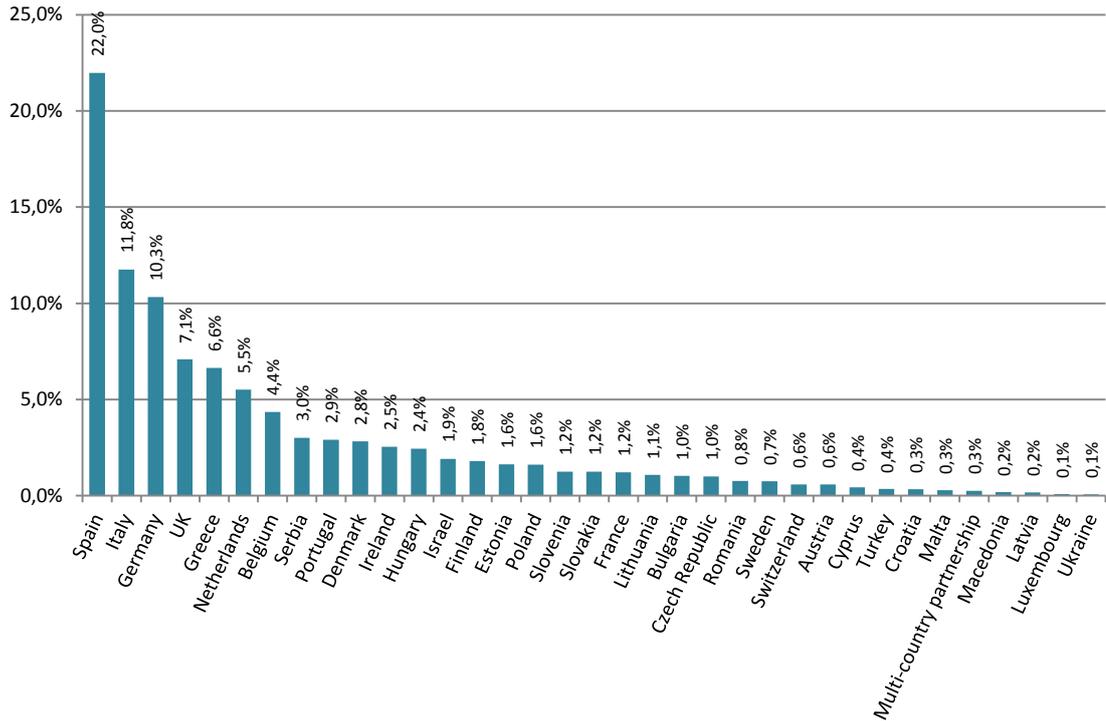
Note: Data relates to calls FI.ICT-2011.1.8 and .1.9, figures are based on budgets

Figure 2.4: National Share of Funding Under FI-PPP Phase 3



Note: Data relates to calls FI.ICT-2013.1.8 and .1.9, figures are based on budgets and do not show the distribution of SMEs and start-ups selected

Figure 2.5: National Share of Funding to Sub-grantees (startups and SMEs) under FI-PPP Phase 3

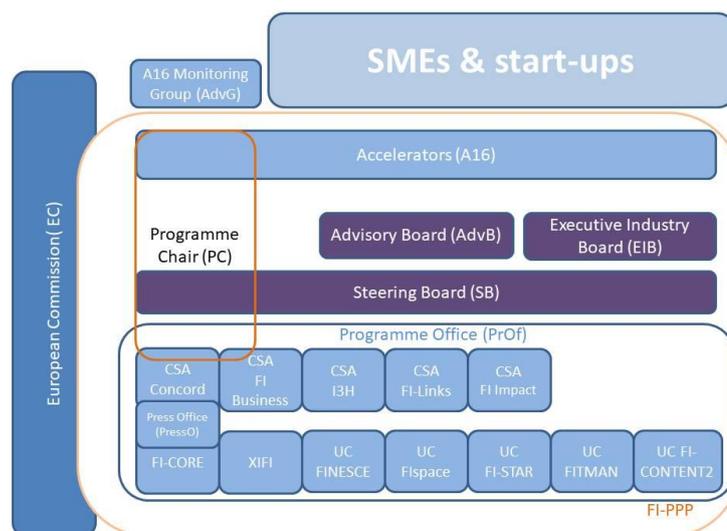


Note: Figures are based on final payments to the sub-grantees

2.5 Governance

The governance arrangements evolved during the course of the programme, reflecting the priorities of each stage. Phase 1 was concerned primarily with set-up; Phase 2 with integration; and Phase 3 with large-scale testing and roll-out and the governance approach was adapted accordingly. Governance was overhauled after Phase 1 following recommendations in the IA1 report. The governance structure under Phases 2 & 3 is shown in Figure 2.6.

Figure 2.6: FI-PPP Programme Governance under Phases 2 & 3



The Programme Chair was a non-executive role that oversaw all aspects of governance and management across the programme.

The Steering Board was the highest FI-PPP Programme governing body. It:

- represented the FI-PPP main stakeholders;
- meet monthly (real or virtual);
- made decisions unanimously, without any option of escalation.

The Advisory Board:

- was independent, with no direct access to deliverables per se;
- required replies by the Steering Board to its recommendations and advice;
- comprised up to eight people, meeting twice per year.

Members of the Advisory Board were also expected to be ‘Ambassadors’ of the PPP and represent it at high level forums (e.g. in the Council and Parliament). The Advisory Board met usually twice per year, its last meeting being in November 2015.

The Executive Industry Board:

- comprised high-level representatives of the industry participants;
- provided general strategic advice to the programme in terms of technological, business and market orientations, and to the European Commission on related industry issues.
- had competence to advise on strategic choices, make suggestions on improving industrial relevance, and promote the take-up and exploitation of the results beyond the FI-PPP.

The Executive Industry Board met only on one occasion, after which it was considered that its role could be fulfilled by the informal Core Industry Group of leading industry supporters.⁵ This Group eventually resulted in the establishment of the FIWARE Foundation.

The Accelerator (A16) Monitoring Group was set up to advise the Commission on implementation of the Accelerator Programme and comprised senior actors in the European entrepreneurship ecosystem.

The PPP Secretariat or Programme Office (provided by CONCORD):

- undertook day-to-day facilitation of the governance processes;
- oversaw other facilitation and coordination measures, such as the Programme Support Actions.

The European Commission had observer status in the Steering Board and Advisory Board, as well as overseeing the implementation of the programme as a whole. The A16 Monitoring Group reported directly to the Commission.

2.6 Evaluation Baseline: Results of the First & Second Interim Assessments

As noted in the Introduction, this Final Evaluation of the FI-PPP follows on from two previous interim assessments made at certain milestones within the Programme’s lifecycle.

The First Interim Assessment (‘IA1’) took place toward the end of the programme’s first year of operation (2012), approximately half-way through Phase 1. The IA1 Panel made a series of recommendations regarding governance, intra-programme collaboration, industrial participation, the involvement of stakeholder communities, and the organisation of take-up actions (see Annex 6). In the light of these, as well as advice from other bodies and other (internal) reviews, the programme (primarily through the Steering Board) and the Commission implemented various follow-up actions.

⁵ The Core Industry Group comprised Atos, Engineering, Orange and Telefonica.

The Second Interim Assessment ('IA2') took place in late 2014, during the early part of Phase 3. It addressed, in particular, the novel implementation measures being used under Phase 3 and the prospects for sustainability beyond the end of the programme in 2016. The IA2 Panel made a series of recommendations designed to mobilise the programme toward sustainability goals (see Annex 6). These were grouped under four headings:

- 1) **Building a trusted FIWARE landscape:** establishing a future business environment for FIWARE products and services that is robust, transparent and trusted. This requires aligning the programme governance towards future needs and making sure the various post-programme initiatives are joined up.
- 2) **Nurturing the FIWARE ecosystem:** growing the nascent ecosystem around FIWARE by broadening and deepening the engagement with stakeholder communities, including developers, industry, SMEs, start-ups, users and investors.
- 3) **Strengthening market confidence in FIWARE:** developing and demonstrating solid business cases for FIWARE technology, raising awareness within the marketplace, and improving access to business-ready services.
- 4) **Promoting take-up of FIWARE solutions:** encouraging use of FIWARE-based solutions across a broad range of sectors and application domains, focusing especially on promising take-up vectors such as Smart Cities and Internet of Things.

The present evaluation takes as its baseline the position of the Programme as reported at the time of IA2, while also offering reflections on the whole FI-PPP experience across the Programme's six-year lifecycle.

3. IMPLEMENTATION UNDER PHASE 3

3.1 FIWARE Technology

The technical strategy underlying the FI-PPP experienced a profound shift during the course of the programme. FIWARE was originally conceived as a generic, trusted and open multi-purpose core platform for the development of smart applications. During Phase 1 this homogeneous approach evolved into a more versatile one that stressed FIWARE as an open source ‘toolbox’, based around a set of generic and specific enablers, from which bespoke solutions could be constructed. This emphasis on an open platform that anyone can use or adapt better reflects the market situation and was honed considerably during Phase 3.

FIWARE offers specific functionalities applicable across many sectors. Today, at the end of the Programme, FIWARE is a market-ready open service platform that offers a fast, easy-to-use and cost-effective development environment for smart solutions. It comprises an open source toolkit of APIs (Application Programming Interfaces) and backend infrastructure components that enable app developers to create new portable and interoperable solutions quickly and cost-effectively. The APIs offered by the components of FIWARE, known originally as FIWARE Generic Enablers (GEs), are public and royalty-free. FIWARE GEs provide specific functionalities (connectivity to IoT, context and big data management, media processing, advanced user interface support, business intelligence, web dashboards, etc.) useful in many sectors.

Box 3.1: FIWARE Today: An Ecosystem for Smart Solution Development

FIWARE is an open platform for the creation and delivery of smart, data-driven solutions, applications and services. A smart solution enables decision-making based on available data in a predictive or adaptive manner. Contextual information must be gathered from many sources (IoT networks, systems and end-users) and compiled to present the user with a description of the context that is being managed. This contextual information evolves over time, requiring managed context information (current and historic) and different data sources to be processed and analysed to implement the expected intelligent behaviour.

FIWARE has a number of distinguishing features. It is open source, meaning that anyone is able to view and modify the source code. It is public and royalty-free, meaning that it is easily accessible to developers at little or no cost. It is modular, meaning that components may be put together in any combination to deliver the functionality required. It is interoperable, meaning that the components work with other systems and modules (both open and proprietary) and can be substituted by or for them. And it is scalable, meaning that it has the quality, robustness and performance required in a real-world commercial software system.

FIWARE is especially innovative in the capabilities it offers to developers for developing smart solutions, where a common standard API for context information management is required. FIWARE solves this need with the FIWARE NGSI (Next Generation Service Interface) API (now in version 2), which is increasingly being adopted as a de facto standard in various applications contexts (see Section 5). FIWARE’s context broker component, known as ORION, supports the FIWARE NGSI API and is able to manage context information at a large scale. Additional FIWARE components have been designed to integrate with the context broker, facilitating the tasks of gathering context information from different sources (e.g. IoT networks) or tasks related to the analysis, processing or advanced visualization of context information.

Context brokers can be used (‘instantiated’ in the jargon of software developers) and joined together (‘federated’) to build a highly distributed smart digital services infrastructure, known as a Context Information Hub. Solutions for public administrations, businesses and individuals will be able to connect to this infrastructure in order to update, consume and share context information.

Source: Panel analysis based on FI-CORE and FIWARE Foundation

An open platform for smart solution development with unique capabilities. So-called ‘smart solutions’ present demanding requirements, in particular the need to gather and process data from a broad range of sources and devices, including IoT platforms, in real time so as to deliver an application or service to the end user (see box). As an open platform for smart solution development, FIWARE offers a reference architecture for context information management (CIM) that is much more complete than is available elsewhere. FIWARE technology is compatible with many existing systems and capable of handling real-time data from many sources in various application settings and so is applicable in many market sectors. Essentially, it is B2B middleware, an operating system on which the other layers necessary for smart solutions may be built.⁶

A more user-friendly approach has been adopted in technical communications. As part of efforts to overhaul the communication, the terminology around the GEs and SEs was changed during Phase 3 to adopt more user-friendly language. Upfront communications referred simply to ‘software modules’ or ‘components for smart solutions’ with the GE and SE labels reserved for more technical level communications with developers (i.e. through the FIWARE Catalogue). In addition, GEs were grouped into seven ‘Chapters’, according to their functionality for building smart applications, and SEs were rebranded as ‘domain specific enablers’ (DSEs), with links established to the catalogues of relevant initiatives.

Usage of the GEs

A few GEs have been used much more frequently than others during Phase 3 and subsequently. According to a survey of sub-grantees, Security (75%), Cloud Hosting (65%) and Advanced Web-based User Interface (61%) were the most deployed FIWARE Chapters (or groups of enablers) (see Figure 3.1).⁷ Data/Context Management and Architecture of Applications/Service Ecosystem and Delivery Framework were also important, while Internet of Things (IoT) Service Enablers remained less used and only a couple of funded initiatives focused on Interface to Networks and Devices (I2ND).

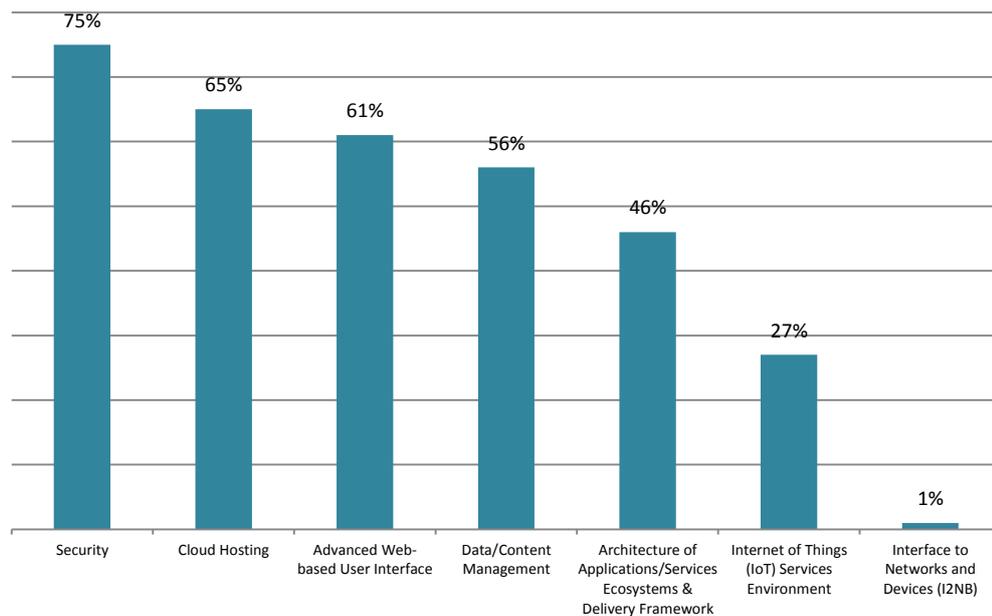
More specifically in terms of enablers within certain Chapters:

- Security: Identity Management (58%) was the most frequently used enabler. It covers a number of aspects involving users’ access to networks, services, and applications. It was followed by PEP Proxy (20%) and Authorization PDP (16%);
- Cloud Hosting: Object Storage GE was by far the most used enabler (51%);
- Advanced Web-based User Interface: POI Data Provider (34%) was the enabler that was most frequently used. It provides spatial search services and data on Points of Interest via RESTful web service API. This was followed by 3D-UI-XML3D (16%), and GIS Data Provider (16%).
- Data Context/Management: Big Data Analysis (56%) was the most deployed enabler, followed by the ORION Publish/Subscribe Context Broker (32%);

Some enablers perform generic functions where there are competing modules under other platforms, whereas others are unique or class-leading. The former require less commitment on the part of developers and therefore are more liable to substitution: the KeyRock authentication module was quoted as one such case.

⁶ Other popular middleware that may be considered competitors to FIWARE in certain application contexts include: AUTOSAR, Robot Operating System, QNX Multimedia, Android API, and Adobe ColdFusion.

⁷ *Update of Impact Assessment and Forecast*. FI-IMPACT Deliverable D2.4, p.33-34

Figure 3.1: Use of FIWARE Chapters by Subgrantees, %

n = 605; Source: FI-IMPACT May 2016

The ORION Context Broker is one of FIWARE's most notable technical achievements. Although not borne out by the survey figures above, technical experts consulted stressed the importance of the ORION Publish/Subscribe Context Broker as one of FIWARE's most significant technical achievements and a distinguishing feature within the marketplace. In simple terms, it offers a common standard API (the FIWARE NGSI API) for context information management, providing a key means for managing contextual information at a large scale (see box above).⁸ Organisations leveraging on this work include:

- GSMA has produced a Reference Architecture for IoT-enabled Big Data Ecosystem solutions, where the FIWARE NGSI API is recommended.
- TM Forum has agreed to adopt FIWARE NGSI as the basis for providing real-time access to context information in relation to Smart Cities (see below).
- The Connecting Europe Facility (CEF), which supports the deployment of digital service infrastructures as part of the EU Digital Single Market, has selected the FIWARE Context Broker technology to become a CEF Building Block.
- ETSI has launched an Industry Specifications Group (ISG) on cross-cutting Context Information Management (CIM) standards which identifies FIWARE NGSI as one of the inputs. The ISG aims to deliver CIM standards that are able to work cross-domain.
- Open and Agile Smart Cities (OASC), comprising more than 100 cities in more than 23 countries, has decided to adopt FIWARE NGSI as a basic API for providing right-time access to contextual data in cities.

With the exception of the Smart Industry domain (developed by FITMAN), the SEs have not been maintained and have more or less disappeared from the FIWARE ecosystem. This aspect is discussed further in Section 3.2 below.

Productisation and Quality Assurance

The evolutionary approach to the development of the FIWARE Catalogue was well justified. As part of the productisation of FIWARE, the number of GEs decreased significantly during Phase 3 in

⁸ NGSI is a protocol developed by the Open Mobile Alliance (OMA) to manage context information. It provides operations such as: the ability to manage the context information about context entities (for example the lifetime and quality of information); and the ability to access (query, subscribe/notify) to the available context information about context entities.

order to focus on those enablers in most demand by the community.⁹ Arguably resources could have been better used by focusing on a smaller set of enablers from the outset. But the enablers chosen would not necessarily have been those most needed by the community. The evolutionary approach allowed developers and users to directly shape the development process and was well justified.

Quality certification was not addressed with sufficient urgency or rigour. It was recognised that the remaining enablers needed to be backed up by systematic quality assurance and that this was best provided by an outside agency independent of the programme. The Fraunhofer Institute FOKUS was appointed to undertake this assessment. It undertook non-functional testing of the FIWARE Generic Enabler Reference Implementations (GERis) to assess whether the GEs were fit and scalable with respect to their intended application. The initial assessment looked at thirteen FIWARE enablers in terms of a variety of non-functional properties, namely: load testing; stress testing; performance testing; scalability testing; endurance (or soak) testing; security testing; recovery testing; and usability testing. Explaining the purpose of non-functional testing in relation to Future Internet applications, Fraunhofer FOKUS noted:¹⁰

...besides load and performance, scalability is a very important criterion. Smart Applications usually start with a low number of users only, but if the application is successful the number of users tends to grow exponentially. It would be critical for the success of the whole FIWARE enterprise, if a successful application had to undergo a major re-engineering because some GE does not scale up.

The Institute concluded that the approach to non-functional testing was adequate and that the results were satisfactory. It also highlighted certain shortcomings and recommendations for future testing. These included concerns regarding the consistency and precision of metrics; that more explicit consideration should be given to combinations of GERis; and that the interfaces to other development processes and the use of the results should be better defined. FOKUS expressed particular concern regarding the use of quality labels that do not appear to have been fully addressed and consequently the value of the FIWARE labelling remains unclear.¹¹ As an indicator here, in August 2017 only nine of 52 enablers listed in the FIWARE Catalogue had been assigned quality labels. **[Recommendation 3]**

3.2 Use Cases and Large-Scale Trials

The Use Cases (Phase 1) and the Large-Scale Trials (Phase 2) provided an opportunity to explore various application areas in depth. They also served to provide an early ‘market pull’ against the FIWARE core project, emphasizing the need to consider user requirements.

Although the LSTs have produced some valuable results, their implementation has been challenging. Key issues, some of which have been highlighted in the interim evaluations, were the following:

⁹ The FIWARE Catalogue currently comprises 52 Generic Enablers, of which 32 are ‘reference implementations’ and 6 are ‘incubated’, meaning they are under active development. A further 12 are ‘deprecated’, meaning they function but are no longer being actively supported.

¹⁰ “FIWARE Non-functional Testing - Process evaluation”, Fraunhofer FOKUS, February 2016. The enablers tested included: Aeron IoT Broker, IDAS IoT Agent, KeyRock Identity Manager, Orion Context Broker, PROTON Proactive Technology, and Wilma PEP Proxy.

¹¹ FOKUS commented: “This deficit [in criteria] shows very prominently in the “assign quality labels” section. Whereas for the metrics RT (average response time) and ER (response error rate) the label criteria are clearly defined, there is the problem how to assign a label for other criteria. Moreover, there is no prescription of how to weight and combine different criteria into one global quality label. Thus, the explanatory power of the label is unclear. In order to avoid conflicts, it is recommended to have clear and transparent labelling criteria similar to the European Union energy label which served as a role model.” The FIWARE website notes that: “The overall label is the average of all individual labels assessed by Sep 2016”, leaving unclear whether the global label quoted now incorporates the FOKUS recommendation.

- As a portfolio of domain-focused projects, the LSTs provided much-needed validation of the generic enablers with respect to the requirements of certain major user sectors. But issues around the core technology, such as late development of the GEs, low relevance, and poor documentation, led some LSTs to adopt other solutions, either off-the-shelf or developed themselves. Hence, the LSTs did not provide the intensive, sector-focused evaluation of the core technology as intended.
- The Phase 2 open calls were mostly used to plug gaps in the operations of the LSTs through subcontracted activities. While the calls proved useful for the LSTs themselves, they were of limited value to the programme overall, in particular for the SMEs and start-ups in Phase 3. Again timing issues were responsible.
- In Phase 3 the engagement of the LSTs was inevitably linked to interest from the accelerators. In many cases, the two had an uneasy relationship. On paper, the continuity was good: six of the accelerators were allied to LST projects and enablers from all of the LSTs were used by A16 grantees. However, resource constraints and a perceived need to focus on their own activities resulted in a lack of bandwidth within the LSTs to engage with the accelerators and service them properly. Some projects were granted extensions (at the Commission's instigation) to address this issue, although no additional funding was made available. Overall, the LSTs were not sufficiently well integrated with and supportive of the Phase 3 grantees as they could have been, given that both were intended to be 'go-to-market' measures.

Nevertheless, certain LSTs have produced concrete results and have been successful within their own spheres (see Box 3.2). The current position in these and other application areas is discussed in Section 5.

The LSTs lacked strategic capacity and were not sufficiently well integrated with the rest of the Programme. LSTs were conceived and run largely as traditional research projects, with long-term time horizons, the involvement of established corporate and institutional actors, and alignment towards associated national programmes. This contrasted sharply with the much more short-term view of developers, entrepreneurs and investors. The LSTs did not cultivate a sufficiently strategic view of their activities that adequately reflected their role as a counter-weight to the core technology development, on the one hand, and the market pull of the Phase 3 activities, on the other. Consequently, for much of the programme the LSTs remained on a parallel, but largely unconnected, track. One example of this is the specific enablers, which in general are much less mature than the GEs and for which, in most cases, the commitments to future development are unclear. There are opportunities to re-engage the communities around the LSTs back into the FIWARE ecosystem [**Recommendation 2**].

Culture clashes led to the loss of many large players. One of the reasons for the lack of strategic insight within the LSTs was the loss of many large firms. During Phase 1, large corporates joined the FI-PPP in the expectation of it being a traditional research programme. The participants were primarily R&D departments with experience of European funding, and there was insufficient engagement from departments involved in strategy and business planning. This led to a certain amount of disillusionment once the nature of the technology to be developed – open, modular, agile – became apparent. The LSTs was the natural place for corporates to have their voices heard but the governance was never sufficiently joined up to ensure that this happened.

Box 3.2: The Large-Scale Trials - Status and Results

- **FI-CONTENT2** developed the FIWARE Media & Content Lab, targeting the needs of developers of web and mobile applications by offering a comprehensive set of media- and content-related software modules. The Lab features documentation, API description, working images and working instances of cloud-hosted media and content software modules and advanced functionality for customising the code to the needs of the developers. More than 20 apps were trialled across three major application domains: social connected TV; smart city services; and pervasive games. Although the Media & Content catalogue is still available via <http://lab.mediafi.org>, the enablers are no longer being supported.
- **FINESCE** integrated GEs, as well as 15 of its own domain-specific enablers, into trials in seven countries in order to demonstrate new business contexts for the energy sector. The resulting platform, known as Utility 4.0, was a prototype and not fully tested. Activities derived from FINESCE are being continued under the H2020 projects SUCCESS, focusing on security, and SOGNO, which aims to develop the Utility 4.0 concept based on Automation-as-a-Service. The results are intended to be of use to small and medium-sized utilities: In addition, FINESCE produced three spinoffs: one of these, GridHound, received funding from the FINODEX accelerator under Phase 3 but in general links with FINODEX were disappointing. Overall, although elements of FINESCE's results are being taken forward within the energy sector, links to FINESCE and FIWARE are not openly acknowledged.
- **Flspace**: developed reusable apps for the agri-food sector, addressing various challenges of farmers, growers, transporters, retailers, service providers and others. It has implemented a FIWARE-based cloud platform that facilitates B2B collaboration between many actors in the agri-food value chain. There are currently 31 software applications that, together with new apps, can be configured to support business processes. An Experimentation Environment for developers to test and experiment with the platform and apps was offered via the Flspace website but is no longer maintained. A Flspace Foundation was set up as custodian of the Flspace brand and results but never became operational; activities are now being pursued through the FIWARE Foundation.
- The **FI-STAR** Platform comprises a set of enablers to fulfil the requirements and needs of the health domain. Some of these enablers were designed and developed on the base of the requirements expressed by the seven use cases involved in the project. Others were added to the platform by the partners who joined the project after participating to the Phase 2 open calls. Although still available via the FI-Star Catalogue (<http://fistarcatalogue.fiware.eng.it/aboutcatalog>), the enablers are all classified as 'beta' versions and are no longer being maintained.
- **FITMAN**: has produced very positive results in the Smart Industry vertical. Ten trials were set up grouped into three clusters (Smart Factory, Virtual Factory and Digital Factory). FITMAN developed 'blueprints' (reference architectures) for each of these clusters, demonstrating that certain FIWARE GEs could be put together in a predefined way that had been tested for working together. These reference architectures meant companies did not have to consider compatibility issues and so provided a valuable reference for them in designing their own smart industry solution. From this base, FIWARE is being taken up in European IoT projects (under the I4MS programme); in Industrial Data Space (IDS), an industry initiative for sharing industrial data; and by certain large companies seeking open APIs (see Section 5.1).

Source: Panel analysis based on information from projects

Sustainability planning within the LSTs was poor and their results are not being leveraged. The lack of strategic capacity in the LSTs is also seen in their approach to sustainability. Despite calls in IA2 to accelerate and focus efforts in relation to sustainability planning, with the notable exception of FITMAN, none of the LSTs have yet gained traction in exploiting their results. Significantly, several of the LSTs do not even maintain a convincing online presence: although all have online catalogues, in most cases the Specific Enablers are either no longer available or are not being maintained (see box above).

Overall, the LSTs have not had as significant an impact on the Programme as originally intended. The Programme was slow to identify the issues and in the meantime much of the momentum provided by the LSTs dissipated and important opportunities were lost.

3.3 Accelerators

Setup and Structure of the Accelerator Programme

The Phase 3 Accelerators (A16) represented the most innovative aspect of the FI-PPP.¹² The final composition and funding of the accelerators was essentially the same as that reported in IA2. The 16 projects are listed in Table 3.1, ranked in order of EU funding available to external applicants, and in Table 3.2 according to the geographical coverage of the consortia. As noted in Section 2.4, the A16 were 100% funded from the EU budget. In addition to the budget allocated to sub-grantees, they received a total of around €20 million for their own project costs to run the accelerator activities, making the EU's total funding €100 million for the Accelerator Programme.

Table 3.1: Sub-grantee Funding by FI-PPP Accelerator Projects

Accelerator	EC Funding for Sub-grantees € m
FICHe	6.24
IMPACT	6.23
INCENSE	6.16
FRACTALS	5.47
SpeedUP! Europe	5.16
CEED Tech	5.00
SOUL-FI	4.97
Flnish	4.87
Fabulous	4.60
FINODEX	4.58
European Pioneers	4.56
FI-C3	4.56
CREATIFI	4.41
FI-ADOPT	4.21
Frontier Cities	3.81
Smart Agrifood2	3.69
Total	78.50

Table 3.2: FIWARE Accelerator Coverage

Country	Accelerator Coordinators	Consortium Partners	Country	Accelerator Coordinators	Consortium Partners
Belgium	3	17	Luxembourg	-	1
Bulgaria	-	1	Netherlands	1	12
Denmark	-	8	Poland	-	4
Estonia	1	2	Portugal	1	1
Finland	1	4	Serbia	1	3
France	1	3	Slovakia	-	2
Germany	3	10	Slovenia	-	1
Greece	-	3	Spain	2	15
Hungary	-	2	Sweden	-	1
Ireland	-	2	Turkey	-	2
Italy	2	12	United Kingdom	-	4
Lithuania	-	1			

Source: FI-IMPACT based on project data

Selection of the accelerators was constrained by FP7 procedures. As noted by the IA2 Panel, the use of traditional FP7 instruments in proposal evaluation, without reference to the bigger pan-European picture, meant that the Commission had little say over the portfolio of projects selected under the A16 calls. This led to an 'over-representation' of accelerators and partners in certain countries (such as Belgium, the Netherlands and Spain) and an under-representation in others

¹² This section focuses on the accelerators as a structural element of the FI-PPP and their performance as a policy instrument. Issues relating to the sub-granting process and its beneficiaries are discussed in section 3.4.3.

(such as France, Sweden, the UK, and parts of Central & Eastern Europe, see Table 3.2). Also, some well-known accelerator/incubator organisations were missing from the chosen pool. The sectoral distribution was more balanced. A16 projects targeted a diverse range of sectors: some focused on a single sector, others on several sectors, and altogether the portfolio achieved fairly comprehensive coverage (see Annex 5 for target sectors). Nevertheless, the reliance on conventional procedures had some ramifications for the performance of the accelerators and the outcome of the sub-granting process and we return to it below. **[Learning Points 2 & 4]**

The Accelerator Programme was suitably timed given the complexity of the FI-PPP. Given the key role of the accelerators in mainstreaming the FIWARE results, the question arises as to whether the A16 programme was launched at the most appropriate time. The Panel encountered opposing opinions on this. From the technologists' point of view, the accelerators can be argued to have started too early, before the technological assets were sufficiently stable. On the other hand, the accelerator community stressed that exposure to users "helps to identify bumps and bugs" in new technology, and from this perspective the Accelerator Programme started too late. The Panel adheres to the middle ground: that the scheduled timing was about right given the FI-PPP Programme's objectives. Any immaturity in the technology was due to strategic issues early on and starting later would only have delayed finding areas for improvement. On the other hand, earlier exposure of users to technology that was far from stable or mature would have severely dented the credibility of the Accelerator Programme.

Activities and Performance of the Accelerators

The Accelerators were a valuable experiment in different intervention modalities. As envisaged, the accelerators adopted a wide range of models and approaches regarding calls, evaluations, operating modes, etc. This variety and freedom to deviate from standard procedures was planned and was central to the experimental nature of the FI-PPP. The operationalisation of so many different models toward the same objective was highly innovative and the extensive and close monitoring of their activities has generated a valuable knowledge base for future initiatives of this kind.¹³

Although the practices had many commonalities, every accelerator operated in a different way. There was also some convergence as the programme progressed, as accelerator teams learnt from each other, particularly in the mentoring approach adopted and helping subgrantees attract new investors. The different focus by vertical market also influenced the selection of the mentors, coaches and technical personnel involved. All accelerators applied evaluation criteria to assess the performance of their subgrantees at specific milestones or check-points. In pipeline accelerators, only subgrantees failing the milestone checks were excluded, whereas in funnel accelerators a step-wise reduction in the number of subgrantees was built into the model, irrespective of the milestone checks, and only the best had their funding maintained.¹⁴

The results show a broad gradient in terms of the A16's capabilities and expertise. Some accelerators were familiar with EC calls and projects but lacked in-depth experience in business acceleration/incubation. As one entrepreneur told us: "Some accelerators were very good, others were just there to spend the money without sufficient qualified people." An alternative approach to project selection, or alternative criteria, might have ensured more consistent capabilities across the A16. Monitoring data shows that four accelerators (CeedTech, FICHe, IMPACT and Soul-FI) were not part of the FI-PPP community when they joined Phase 3 (Figure 3.2). They all had a strong presence of professional accelerators or incubators, and no previous participation in Framework Programme projects although this does not appear to have influenced their performance.¹⁵

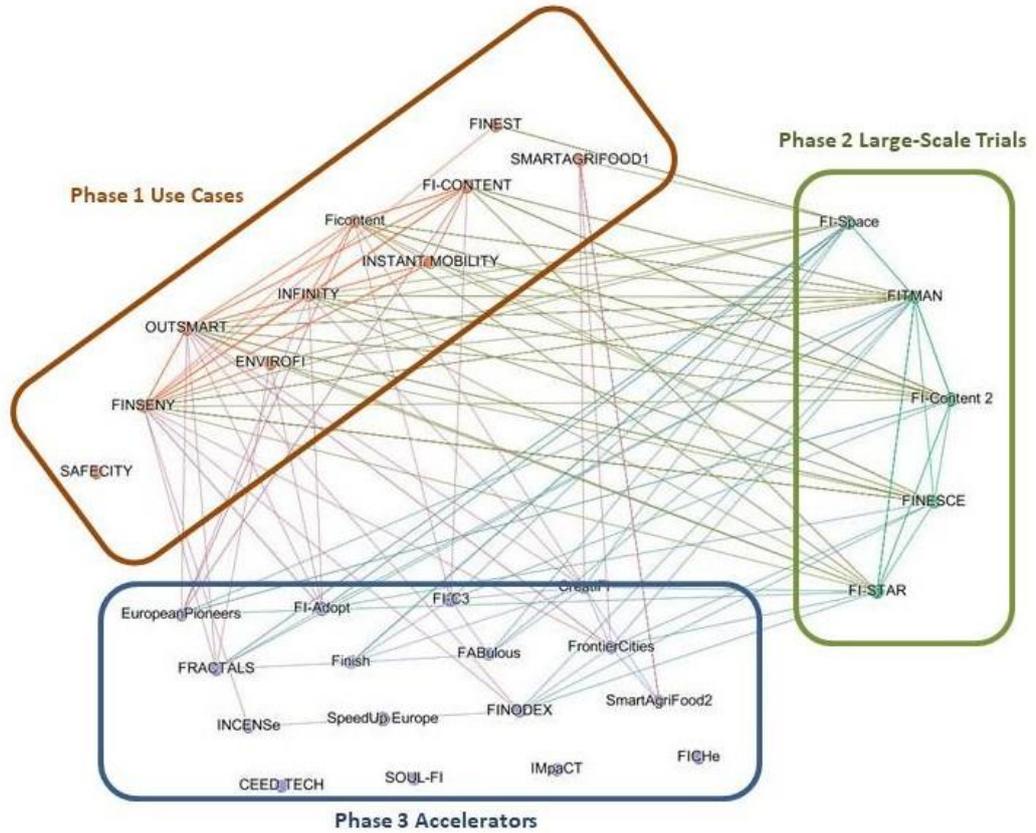
¹³ Monitoring results are available through the outputs of the Phase 3 CSAs, primarily FI-IMPACT.

¹⁴ In FABULOUS, for example, the plan was to select 150, then maximum 39, then 10; in FICHE 80, then 40, then 20.

¹⁵ *Update of Impact Assessment and Forecast*. FI-IMPACT Deliverable D2.4, Annex 8.5: Analysis of Accelerators' Good Practices, pp.3-4.

Cultural factors influenced how the A16 operated. The differing backgrounds of the A16 were evident in implementation, where some were seen as being too rigid/cautious in their approach. Start-ups need flexibility and in some cases felt constrained by the rules of the Phase 3 open calls and the way in which they were applied. Those accelerators with more professional backgrounds appear to have understood this better and adapted their approach accordingly, by communicating in start-ups’ own language (e.g. referring to ‘deadlines’ not ‘calls’) and offering a certain amount of flexibility in what was submitted and when.

Figure 3.2: Network Analysis of FI-PPP Partnerships



Legend: Purple nodes are projects from phase 3, green nodes are projects from phase 2 and orange nodes are projects from phase 1. Connecting lines indicate one or more partners in a project subsequently participating in another. Source JSI for FI-IMPACT 2016

Essentially, the performance of individual accelerators can be considered along two axes: firstly, the emphasis placed on the contribution of FIWARE within the companies being selected; and secondly, the emphasis on business acceleration. The combination of these two factors has implications for the type of companies supported and, consequently, the nature of the results achieved, as shown in the following matrix.

	Weak Acceleration	Strong Acceleration
Strong FIWARE Contribution	Contractually driven Process focused on selection of companies with significant FIWARE content/commitment but vested in companies unlikely to success	Realising full potential Process identified companies with significant FIWARE content and supported them to succeed
Weak FIWARE Contribution	Poor management Process selected companies with minimal FIWARE content/commitment and weak commercial prospects/support	Conventional accelerator Process selected companies with minimal FIWARE content/commitment but supported them to succeed

Consortia with more experience in running start-up accelerators appear to have performed better. The performance of the A16 is difficult to assess in quantitative terms. FI-IMPACT undertook a detailed study of ‘good practices’ defined as activities “shown to have contributed to the good performance of sub-grantees” and developed a database of 23 comparable indicators.¹⁶ Its conclusion was that “most correlations are not statistically significant” and overall the data provided only “weak signals” regarding accelerator performance. These signals included the positive role of professional accelerators within consortia, and positive impacts of practices such as workshops, matchmaking and providing gateways to further funding. Thus, the larger and more professional consortia, and those with strong links to institutional investors appear to have performed better overall. This is in line with experience worldwide, which shows that the most successful accelerators tend to involve established market players, understand the needs of start-ups in their sector, and provide complete end-to-end services and support. Good accelerators excel across the board and know their business: in short, they behave like entrepreneurial organisations themselves.

The accelerators converged towards common practices and benefited from mutual learning. The A16 generally worked well together. Some did not fully appreciate the importance of the community element initially, choosing to focus instead on their own set up and complying with EC requirements. Concerted efforts were made to build a team around the accelerators, through regular workshops and webinars, and were broadly effective. The A16 were able to learn from each other and developed common understanding and practices to build critical mass and the FIWARE brand. However, those new to the accelerator space appreciated greater benefits from the community-building and joint branding than more experienced hands, who tended to see participation more as a matter of compliance.

The Programme struck broadly the right balance between SMEs and start-ups. Some consultees questioned whether the A16 should have focused more on SMEs rather than start-ups and whether they differentiated between the two sufficiently. The Phase 3 calls rightly specified “SMEs and start-ups” and the Panel considers the approach taken by the A16, which allowed room for both types of businesses, was broadly appropriate. Too much emphasis on start-ups could be wasteful given the high failure rate. As FI-IMPACT has noted, the Commission’s effort to get the A16 to converge “helped consortia which started the programme with a focus on SMEs rather than start-ups to upgrade their innovation and growth objectives and helped them to adapt to acceleration activities with which they were not familiar”.¹⁷ Of course, the two have different support needs and, as argued above, in certain sectors SMEs should have been better served through greater engagement with and support from the LSTs.

Self-assessment tools were not used to their fullest extent. FI-IMPACT developed a self-assessment and learning tool for sub-grantees. This allowed beneficiaries to assess their own performance based on external performance indicators and best-of-breed KPIs. It provided an advanced interactive benchmarking approach as well as a means of tracking long-term sustainability after the end of the project. Despite its obvious business benefits, FI-IMPACT found that the tool had some shortcomings.¹⁸ It was not well suited to start-ups which are still in the very early phases of defining their idea. And respondents did not always appreciate that the assessment was meant to be repeated on a regular basis. These deficiencies may reflect the lack of mentoring support: mentors complained that they did not have sufficient time to spend with companies and undertaking regular self-assessment was often one of mentors’ most recommended practices.

[Learning Point 6]

Review, Monitoring and External Support of the A16 Programme

¹⁶ *Update of Impact Assessment and Forecast*. FI-IMPACT Deliverable D2.4, Annex 8.5: Analysis of Accelerators’ Good Practices

¹⁷ *Ibid.*

¹⁸ *Assessment Report*, FI-IMPACT Deliverable D3.3.

The A16 benefited from valuable independent advice. The Accelerator Monitoring Group (AMG) was set up (according to its terms of reference) “to oversee the effective and efficient implementation of the A16 programme”. A panel of highly experienced experts reviewed all 16 accelerators and shared their experiences on a regular basis. They facilitated discussion within the A16 about how best to approach their role and achieve their objectives. The Group produced an insightful report on ‘Shared Learnings’ for the Commission, stressing the need for accelerators to see themselves as entrepreneurs and adopt a “startup mentality”. The AMG made some very valuable observations, although its advice was not always heeded either by the Commission or the accelerators. [Learning Point 8]

The VIP Programme was another example of Phase 3’s innovative approach. Towards the end of Phase 3 (November 2015) a specific action, known as the VIP Programme, was launched to provide focused support to a small number of start-ups identified by the advisors as potential success cases (FIWARE Champions). Participation was limited to 20-30 companies, selected on the basis of their growth and visibility, i.e. companies interesting to the financial community (15 were finally selected). A condition of selection was that start-ups had to be making good use of FIWARE technology. A three-day VIP Bootcamp was organised at which start-ups had the opportunity to learn pitching skills and present actual pitches to VCs and investors. The event received high approval ratings from both start-ups and mentors: the experts agreed that pitches were significantly improved and that the training had been worthwhile. Follow-up mentoring sessions were organised through FI-Business.

The VIP Programme is another example of the innovation and flexibility shown throughout the FI-PPP, mirroring the workings of the VC market in a highly realistic setting. Two other company segments were considered for dedicated support actions: SMEs in the modest growth range and companies with a socially-oriented product. In neither case did specific measures materialise. [Learning Point 5]

3.4 Coordination

3.4.1 Governance

Governance during Phase 3 was stable and broadly effective. Issues flagged in previous assessments regarding shortcomings in the governance arrangements were resolved and the governance structures worked much more effectively as a result. In particular, the appointment of a Programme Chair as a non-executive role to oversee all aspects of governance and management across the programme brought much needed stability and a more joined up approach.

Formation of the FIWARE Foundation experienced prolonged delay that created a communications vacuum. The formation of the FIWARE Foundation took much longer than expected. It was actively being discussed at the time of the Second Interim Assessment in late 2014. Indeed, the IA2 Panel called for the Foundation to be established by June 2015 at the latest, ramping up to a full operational state by the end of that year. Yet the Foundation was not formed until October 2016, did not become fully operational until January 2017, and did not take ownership of the FIWARE assets until March 2017. Many factors contributed to this delay, including the time taken to negotiate legal agreements between the founding parties and to provide the necessary quality assurance (e.g. regarding robustness and scalability) for the technology to get the backing of large companies. Whilst these processes were underway it appeared to the outside world – as well as to many within the programme – that nothing was happening. This created a communications vacuum, leading to news about the Foundation being announced and re-announced several times in order to fill the void. A clearer path in establishing the Foundation would have enabled greater impact when it eventually arrived.

Sustainability planning was uncoordinated and poorly managed. One area where the governance was not fully effective was in sustainability planning. The various strands (i.e. the core project and the five LSTs) each pursued their own sustainability strategies with little or no coordination

between them. The IA2 Panel commented on this approach, warning that “the pursuit of multiple sustainability initiatives in parallel carries inherent risks”. While noting that the diversity of potential models and strategies opening up for FIWARE was positive, the Panel observed that “a level of coordination will be required that is not apparent at present”. This coordination did not materialise, resulting in the disjointed situation reported in Section 3.2 above. The Foundation is having to work hard to re-connect with the legacy of the LSTs, a situation that could have been avoided had a more coordinated approach been followed from the outset. **[Learning Point 10]**

3.4.2 Coherence

The Programme Support Actions (PSAs) generally performed well and generated useful insights and tools. Each of the four Phase 3 PSAs produced useful insights and tools. The ongoing monitoring of accelerator calls and self-assessment tools developed by FI-IMPACT, the training and support activities delivered by FI-Business, and the FIWARE MUNDUS brand developed by FI-LINKS were all valuable contributions to the Accelerator Programme.

The specific value and contribution of the I3H network is not readily apparent. I3H (subsequently rebranded as the iHub network) was intended to develop the business ecosystem alongside the PPP, whereas the A16 focused on innovative applications of the FIWARE enablers and technologies. The IA2 Panel observed that the roles of the two were not sufficiently distinct and the present Panel notes that the initial network was not sustained after the funding expired, thus leaving nothing by way of legacy. The situation should have been addressed more decisively at an early stage.

The PSAs were not coordinated sufficiently and their experiences are not being fully exploited. The PSAs were standalone projects (established using the CSA instrument), each with its own separate reporting line into the Commission. This complicated communication and governance to some extent, and a more joined-up, programme-focused approach would have been beneficial. Furthermore, opportunities to draw on the PSAs’ substantial and very valuable experiences from the Accelerator Programme are not being fully exploited. For example, the reviewers recommended that each of the projects should produce publicly accessible digests of their experiences, documenting the lessons learned. To date only FI-IMPACT has produced such a report¹⁹: FI-Business, FI-Links and I3H have not. **[Recommendation 6]**

3.4.3 Sub-Granting Process

The response to the A16 calls was extremely positive, attracting a large number of high quality applications from across the EU and beyond. Overall, around 8300 proposals were submitted under a total of 31 calls, from which 1047 applications were selected for funding. The number of submissions was significantly higher than the KPI expectations for the accelerators. Successful applicants included SMEs, start-ups and entrepreneurs, all of whom committed to at least a minimum use of the FIWARE technology. As well as the financial grant, the projects selected received a variety of technical and business support to test their ideas. Key funding parameters by accelerator are summarised in Table 3.3. Further analysis is presented in Box 3.3, with additional detail in the Statistical Summary in Annex 5.

Application rates varied markedly and appear to reflect national circumstances. The geographical imbalance observed at the time of the Second Interim Assessment continued due to the strong dominance of Southern European stakeholders. Thus, Spain and Italy accounted for the highest shares of both submissions received and funding allocated; countries such as the UK and France ranked lower compared with the pattern of, for example, business angel funding (see Figure 2.5 and Box 3.3). This appears to reflect the active national ecosystem around FIWARE in Spain (and to a lesser extent Italy) that compensated for a rather weak early stage financing set-up. The self-reinforcing nature of an ecosystem is such that as scale increases so does confidence in the approach and new entrants are attracted. However, take-up was sub-critical in some parts of Europe, in particular Central and Eastern Europe, despite focused efforts (such as CEEDTech and

¹⁹ *Accelerating European Growth: A look at the impacts of the FIWARE Accelerator Program 2014-16*, FI-IMPACT Final Publishable Summary Report, 2016. Accessible at www.fi-impact.eu.

Fractals) to focus on these markets. These results also suggest that such instruments offer greater benefits to and have higher take-up rates in countries with fewer seed funding opportunities.

Table 3.3: Key Sub-grantee Parameters per Accelerator

Accelerator	Funnel (F) vs Pipeline (P)	Total no. of grantees funded	No. of grantees eliminated ²⁰	Average EC investment per grantee, €	Share of total grantees, %	Share of total applications, %
European Pioneers	P	25	0	182200	2.4	11
INCENSE	P	42	0	146667	4.0	6
Frontier Cities	P	28	0	136249	2.7	7
FI-ADOPT	P	32	0	131611	3.1	5
FRACTALS	P	43	0	127226	4.1	3
FI-C3	P	40	0	114000	3.8	7
IMPACT	P	63	1	98849	6.0	18
FICHe	F	79	43	78929	7.5	4
Smart Agrifood2	F	48	32	76875	4.6	2
FInish	P	66	1	73759	6.3	2
CEED Tech	P	80	4	62500	7.6	12
CREATIFI	P	78	7	56571	7.4	5
SpeedUP! Europe	F	94	38	54870	9.0	2
Fabulous	F	96	41	47900	9.2	2
FINODEX	F	103	60	44466	9.8	6
SOUL-FI *	F/P	130	0	38261	12.4	9
TOTAL		1047	227	74991	100	100

* SOUL-FI operated a hybrid model that was part pipeline and part funnel.

Source: European Commission and FI-IMPACT

²⁰ As at June 2016

Box 3.3: The FIWARE Accelerator Programme at a Glance

There were considerable differences in the number of proposals received by each of the accelerators due to their different strategies for attracting and then selecting promising proposals (see funnel vs pipeline discussion in the main text). This, combined with the variety of target markets (many versus few), has meant that some accelerators attracted up to ten times more proposals than others. Just under half (49%) of all proposals were submitted to four accelerators: IMPACT (18%), CEEDTech (12%), European Pioneers (11%) and SOUL-FI (9%), which together received over 4,000 submissions.

The geographical distribution of submitted proposals was very broad. Although attracting applications from many countries, three EU countries accounted for almost 50% of all applications: Spain (25%), Italy (11%) and Germany (10%). No other country accounted for more than 5% of proposals submitted, with the UK at 5% and the Netherlands at 4%. France had just a 2% share of applications. Spain's share in the total applications actually increased since IA2 (from 20% to 25%).

Analysis shows a strong correlation between the home country of the accelerator coordinator and the geographical origin of the applicants. Spain was the most significant source of submitted proposals for nine of the A16 (SOUL-FI, FINODEX, FICHE, Smart Agrifood 2, FIC3, FABulous, FI-Adopt, Impact, Creatifi). Germany had the largest share of proposals in three accelerators (SpeedUp, Finish and European Pioneers), while Fractals (which had a Serbian coordinator) also recorded a high response from its home market.

Success rates varied markedly between countries. Applications coming from Sweden (55%), Greece (54%), Serbia (48%), and the Netherlands (44%) had higher success rates compared with other countries from which at least 20 proposals originated. The Netherlands showed a good level of submitted proposals (133 submissions), as well as a high success rate in terms of number of selected initiatives (59 sub-grantees). The UK also performed well, with 66 sub-grantees from 155 submissions (43%), although was not as strong as other indicators would predict. By comparison, in 2015 the visible business angel funding investment market was led by the UK (17.2% in numbers, 15.8% by value), Spain (7% in numbers, 9.1% by value), and Germany (5.4% in numbers, 7.2% by value), with France in fourth place by value (8.9% in numbers, 6.9% by value) and Italy much lower (2.2% in numbers, 2% by value).²¹ Thus, by this measure Spanish and Italian applicants were particularly well represented in FIWARE calls and funding, whereas the UK and, particularly, France were less active and less successful than would be expected compared with their very active business angel markets.

The accelerator with the fewest sub-grantees was European Pioneers, with 25, and that with the most was SOUL-FI, with 130. Only two of the A16, SOUL-FI and FINODEX had more than 100 sub-grantees.

Around one-third of sub-grantees (367, 35%) received between €10-50k. A further 23% received between €50-100k. And another 302 sub-grantees (30%) received funding of more than €100k from the FIWARE Accelerator Programme. A majority (60%) of the grantees were developing solutions addressed to the business market. One-fifth (20%) of the funded initiatives targeted both the business and consumer markets, while 20% addressed purely the consumer market. Many of the start-ups and SMEs are contributing to the digital transformation of traditional sectors, such as agriculture and manufacturing, as well as improving consumers' lives with their smart apps and services.

In terms of the size of the teams/organisations being funded, 55% consisted of 2-5 people. The next most common was businesses with 6-10 team members with a 24% share, while larger businesses and one-person businesses accounted for around 10% each. Approximately half of teams had between one and four years' experience of start-ups or running a company, and around one-fifth of selected proposals had four or more years of operations. This suggests that selected teams were promising in terms of size, with almost three-quarters having 2-10 team members, enough to build team synergies but not too many to hinder agility. Similarly, there was a promising balance between recent start-ups and more mature organisations.

Source: Panel analysis based on European Commission and FI-IMPACT data

²¹ EBAN, *European Early Stage Market Statistics 2015*, Figure 4, <http://www.eban.org/wp-content/uploads/2016/06/Early-Stage-Market-Statistics-2015.pdf>, accessed 23 June 2017.

The accelerators were free to adopt their own methods in selecting and evaluating sub-grantees and in general these strategies fell into one of two approaches:

- **A funnel approach**, meaning that a group of enterprises was selected at the start of the programme, received some initial funding, and then had to undergo multiple check-points with increasing requirements at each stage to measure progress. Entrepreneurs achieving the expected results at the check-point were eligible to be considered for further funding but this was not guaranteed; those failing received no further support and were eliminated from the programme. Only the best, up to the maximum number of available places in the next stage, received additional funding. Under this model, the total number of sub-grantees therefore diminished over time. The accelerators adopting this approach were: FABulous, FICHe, FINODEX, SmartAgriFood2 and Speed-up Europe.

A pipeline approach, meaning that the accelerator selected a certain number of entrepreneurs for each call and then accompanied them for a defined period. The funding was usually spread out over the project life with an advance, additional payments due on achievement of certain milestones, and a final payment distributed at the end of the programme. This model was followed by 11 accelerators (see Figure 3.4 above). Of course, the accelerators were still able to stop funding any sub-grantees not up to the challenge.

As shown in the Table, the funnel accelerators dropped funding from between 40% and 60% of their initial sub-grantees. The majority of pipeline accelerators eliminated a maximum of one enterprise, except for CEEDTech and Creatifi which stopped funding 4 and 7 sub-grantees respectively.

A few accelerators, led by European Pioneers, granted funding of over €100k to their sub-grantees, while most provided a lower sum. There was a clear difference for the funnel accelerators between the average funding and the funding provided to the best performers surviving all the check-points. Overall, the average funding for all 1047 sub-grantees was just under €75k. The highest funding per sub-grantee was provided by European Pioneers and the lowest by SOUL-FI (which paid just €10k to its initial selection of sub-grantees).

Each of the approaches has advantages and disadvantages. Arguably the pipeline allows more efficient use of funds since the resources are focused on a smaller group of companies from the outset (and requiring rigorous selection criteria). The funnel, on the other hand, allows more time to winnow down to those with greatest potential because of the milestones for receiving subsequent tranches of investment. Experts are divided on which approach is ‘best’ and both are found, and applied very successfully, within the accelerator community worldwide.

Sub-grantees were not always as committed to FIWARE as was intended. In theory sub-grantees were expected to use FIWARE technology as a condition of their funding, but in practice this was not always the case. Although no supporting data is available, anecdotal evidence suggests that FIWARE was not used to the extent intended, either because core components were not sufficiently stable and/or sub-grantees were not actually mandated to do so. Some accelerators felt that such a condition was difficult to justify to applicants given the status of the technology, in particular the lack of reliable reference cases. Meanwhile, those involved in FIWARE technology development felt that some grantees were, in the words of one consultee, “using the grants to expand their networks” and were not interested in contributing to the FIWARE community. Certainly, there is little evidence that the start-ups actively improved the technology. On the other hand, start-ups complained that FIWARE was too ‘feature rich’ and poorly documented. FIWARE is one of many toolboxes available to applicants and ‘interest’ is not necessarily evidence of true market adoption. Hands-on technical support was critical but was not available within the A16 at the level required. Only six of the A16 offered additional technical support for FIWARE (beyond that provided by the Programme) and only one accelerator (FABulous, focused on manufacturing) offered other technical support. This points to a significant gap in the A16’s offering that, if addressed earlier and consistently, might have led to greater uptake of the FIWARE technologies and improved their development trajectory. **[Learning Point 5]**

Beneficiaries showed a strong bias towards B2B markets. In contrast to the perception that start-ups are only interested in consumer markets (i.e. chasing the ‘Facebook dream’), the data clearly show business markets as the main focus for Phase 3 sub-grantees. Three-fifths (60%) of funded initiatives were mainly targeting business-to-business (B2B) markets and a further 20% were targeting both businesses and consumers (B2C/B2B). Furthermore, many sub-grantees were helping to drive innovation in traditional sectors such as agriculture (18% of all projects) and healthcare (16% of projects). Around 18% were working on cross-sector solutions that could be applicable across more than one market sector. Given that around half of sub-grantees were under one year old and two-thirds had five or fewer employees, clearly it is not only the more experienced researchers/larger enterprises that see the potential in B2B. Overall, this activity data paints a positive picture in view of FIWARE’s goal as a B2B middleware platform.

Phase 3 beneficiaries continue to perform strongly and many have received additional investment. The visibility and positioning of FIWARE grantee businesses continue to be monitored through the online service tool MatterMark.²² FI-IMPACT initiated use of Mattermark to track progress of FIWARE sub-grantees as a complementary data source to its own assessment survey. The MatterMark service uses online sources and other relevant materials to create scores for companies, mostly start-ups. It also tracks external investments based on publicly available information. Following the end of the FI-IMPACT project, the Commission has continued this exercise internally, focusing on selected high potential sub-grantees.

To date around 100 external investments have been recorded into FIWARE sub-grantees, ranging from a few tens of thousands of euros to millions. The largest investment recorded to date is €8.5m (US\$10.0m) in 8Fit, a health and fitness company building apps to encourage healthy lifestyles. It was supported by the IMPACT accelerator. Second, with investment of €6.8m (US\$7.5m), is Nozomi Networks, a security start-up involved in protecting industrial equipment. Seven other investments of more than €2.0m have been recorded into FIWARE companies (see Table 3.4). Total reported investments increased from €15.6m in May 2016 to around €85m in September 2017, a fivefold growth in just over a year. Despite the ad hoc nature of this tracking mechanism, the rate of growth is impressive.

Table 3.4: Top Ten External Investments in FIWARE Grantee Businesses²³

Company	Accelerator (and type F/P)	External Funding (Euro)	Company Details
8Fit	Impact (P)	€8.5m	8Fit has developed an app and associated online community offering personalised workouts, fitness guides and nutrition plans. With offices in Berlin and California, to date the company has secured investment ~\$6 10 million (http://8fit.com)
Nozomi Networks	Incense (P)	€6.7m	Security startup Nozomi raised US\$7.5 million to protect industrial equipment (www.nozominetworks.com)
Infarm	European Pioneers (P)	€4.0m	INFARM is pioneering on-demand farming services to help cities become self-sufficient in their food production, while eliminating waste and reducing their environmental impact (http://infarm.de)
Smartbow	Finodex (F)	€3.5m	SMARTBOW has developed a system to locate farm animals and detect heat and changes in rumination behaviour. The farmer receives alerts on PC, smartphone or tablet. (www.smartbow.at)
Oviva	FICHE (F)	€3.0	Oviva is a digital health company that helps people with

²² Mattermark is an online service for investors and business analysts which helps them to monitor and assess companies in relation to their financial value and their uptake within a market. It is intended to track progress of start-ups and SMEs. Mattermark automatically gathers data about companies and accelerators online and presents them as lists or accelerators reports.

²³ As at September 2017.

			conditions such as obesity, diabetes and food allergies improve their health with medical nutritional therapy from professional dietitians. Its app is being trialled by the UK National Health Service (www.oviva.com).
MINT Labs	FICHE (F)	€3.0	Cloud-based advanced neuroimaging analysis and visualization platform. Specialists can upload, process and analyse their big datasets, all within the browser.
Splash	European Pioneers (P)	€2.24m	Based in Berlin, Splash has developed a virtual reality app to capture and create 360° videos. (www.splashapp.co)
Pantavision Digital Diagnostics	FICHE (F)	€2.2	An innovative supplier of analytical solutions for medical diagnostic professionals. Focusing on the visually oriented disciplines radiology, pathology and anatomy, it provides healthcare professionals with visual expert information (www.pantavision.com).
Artomatix	Creatifi (P)	€2.1	Artomatix is an Irish company, focused on smart and automatic texture generation for 3D environments. It uses AI to make it easy for experts and enthusiasts alike to focus on creativity when building 3D content. (http://artomatix.com)
Pharmawizard	FI-Adopt (P)	€1.9	Pharmawizard is a health app to help people choose and use drugs. With Pharmawizard you can know brand name drugs, generics and OTC, active ingredients, indications and intolerances. The company has reported 110K+ registered users and has raised an additional €700k in private funding and €1.9m from EASME funding (http://pharmawizard.com).

Looking into this data further, we see that 50% of the top ten investments originate in just two accelerators (FICHE and European Pioneers), while three accelerators (these two plus Impact) account for 11 of the top 20 investments. Referring back to the funnel/pipeline discussion, the funnel approach has delivered four of the top 10 investments (40%) despite being followed by only 25% of the accelerators. This picture is very changeable, however, with new investments being made all the time. **[Learning Point 9]**

The initial investment in the Accelerator Programme has already been matched. The latest information available through MatterMark (September 2017) and complementary sources indicates that the total additional investments in FIWARE sub-grantees have exceeded €80m. This represents a major milestone, being the amount originally allocated by the Commission for the Phase 3 Accelerator Programme. To have reached this milestone less than one year after completion of Phase 3 is a significant achievement and can be seen as a vindication of the FI-PPP's whole philosophy and approach. On the other hand, potential synergies within the existing FIWARE ecosystem are not being fully exploited: for instance, there are missing links to corporate members' in-house accelerators and venturing activities.

Lack of ongoing monitoring is hindering a longer term view of Phase 3 achievements. While these data provide positive indications, it remains to be seen how the sub-grantee companies perform in the longer term. Efforts in this respect will be hampered by the lack of ongoing monitoring activity. The Commission continues to monitor external investments through MatterMark on an informal basis, but there is no longer term monitoring programme for FIWARE outcomes. FI-IMPACT's monitoring activities ended prematurely, even before the final A16 grants had been issued (and despite recommendations from the project reviewers). Consequently, we only have a very partial view of companies' go-to-market activities, one of the most crucial aspects of the whole programme. Ongoing monitoring would have had significant added value and in the Panel's view it is inappropriate and regrettable that a longer term monitoring effort was neither foreseen nor implemented. **[Recommendation 4 and Learning Point 9]**

The wider economic impacts of the FI-PPP, including the start-ups, are discussed in Section 4.

3.5 Communications and Community Building

3.5.1 Communications

Communications improved markedly, creating a more cohesive view of the Programme to the outside world. One of the distinguishing features of the FI-PPP has been its approach to communications. In response to criticisms in the First Interim Assessment that communication activities did not match the level of ambition of the Programme, a complete overhaul was undertaken that put the communications effort on a more professional footing. This resulted, among other measures, in the launch of the FIWARE brand, the setting up of a professionally-managed Press Office, and a much-improved online presence.²⁴ Adoption of FIWARE as a single brand covering all results and services allowed a cohesive approach to marketing and communications and was one of the most influential steps in creating a unified view of the programme to the outside world.

The picture was one of continuous evolution rather than one-off change. Having been appointed initially as a contractor to FI-CORE, the core technology project, the role of the FIWARE Press Office evolved gradually from disseminating the technology, to building the ecosystem and promoting the FIWARE brand more generally, to, in the latter stages, publicising the Foundation. The Press Office successfully took on board early criticisms that it served only the needs of FI-CORE to become representative of the programme as a whole. At its peak, staffing of the Press Office amounted to 5-6 full time equivalents (FTEs), a significant effort by the standards of EU programmes.

Communications lacked a sufficiently sharp business focus. Despite the active involvement of marketing professionals, during the latter stage especially the messages around FIWARE were still not sufficiently sharp in business terms. The USPs for FIWARE within the market remained too vague for much too long. Communication efforts did not achieve the scale and effectiveness necessary to reach the target audiences. This is evidenced, for example, by the fact that large companies (even those involved in the programme) were not sufficiently aware of its achievements or even its existence. Newcomers, too, were often not aware and the Foundation thought the messaging it inherited sufficiently unclear as to undertake a complete overhaul. **[Learning Point 7]**

Focused communications activity around the A16 results should have been sustained. Under Phase 3 the activities of the Press Office were supplemented by dedicated activity around the A16 results by the FI-IMPACT PSA. A series of profiles and case studies was developed for funded initiatives (sub-grantees) considered high potential for success. The best of these success stories were promoted through an online campaign, created and shown on IDGs own network of technology websites, and reached more than 1.8M European IT managers and buyers. While the headline figures are impressive, the campaign – which was executed only in the final month of the FI-IMPACT contract – came very late and was not systematically assessed. An earlier, more sustained campaign would have been more beneficial.

The LSTs have largely dropped from view. The Panel has been particularly struck by the low profile of the LSTs in Phase 3 and since. Several of the LST project websites have already been removed and those that remain have not been maintained since well before the programme ended. Apparent links to LST activities from the FIWARE portal (now maintained by the Foundation) are not fully functional. This outdated online identity does not help brand building around FIWARE and requires attention even at this late stage. **[Recommendation 2]**

3.5.2 Engagement with Major Industry Players

FI-PPP lost the support of initial industry stakeholders and struggled to re-engage. The situation regarding industrial involvement was described at the time of IA2 as “patchy” and there has been no real improvement since then. During the early stages, certain players chose (for various reasons) not to continue their participation, thus diminishing its reach within the corporate world. During Phase 3 there was renewed interest from some parts of industry as the rollout phase approached.

²⁴ The FIWARE Press Office was provided by OgilvyOne Worldwide, which continues to provide public relations support to the FIWARE Foundation.

The announcement, in March 2015, by four leading players to join forces to push for common standards for Smart Cities based on the FIWARE platform can be seen as pivotal.²⁵ It helped not only to build FIWARE's profile in the Smart City market but also helped to cement the partnership that went on to become Founder Members of the FIWARE Foundation. **[Learning Point 3]**

Efforts to engage should be renewed by the Foundation. To date, then, few large companies have been involved in FIWARE, although clearly those that are have had a profound impact. The active and competitive involvement of large players will underpin the openness of the FIWARE platform, provided the pool of platform providers is sufficiently diverse. The arrival of the Foundation provides another opportunity to (re-)engage them. **[Recommendation 1]**

3.5.3 Engagement with SMEs, Startups and Entrepreneurs

FIWARE succeeded in engaging a relatively limited, but active, community of SMEs, start-ups and entrepreneurs in using its technology. This fledgling ecosystem brought together companies of different sizes, interests, capabilities, and backgrounds to work together and grow their ideas (see statistical summary in Annex 5). In the words of one accelerator manager: "The benefit [for companies] was not the GEs, but enabling the innovative environment by providing access to a network, technology and mentoring".

FIWARE has raised significant interest amongst the investor community in Europe. The involvement of investors in several individual accelerators and the A16 as a whole helped to build links to their local investor communities. Specific measures, such as the VIP initiative, were put in place to provide companies with exposure to investors and hone their pitching skills. Anecdotal evidence suggests those accelerators with active involvement of investors tended to perform better although this is difficult to verify. Overall, the funded accelerator model represented a good deal for investors, since it effectively subsidised other actors to undertake (first pass) due diligence on their behalf, which is an extremely costly activity. Effectively, the FIWARE brand was being used to reduce investor risk and this approach could be capitalised on further in the future.

The investor community needs to be further engaged. For the period in which they operated, the FIWARE accelerators were a significant addition to the pool of business angel (BA) and venture capital (VC) funding in Europe for the digital sector. According to Panel estimates, the A16 funding was equivalent to at least 10% of these markets in FIWARE-related areas and probably much higher in the FIWARE focus areas (see analysis in Annex 5). Furthermore, investors confirmed to the Panel that, in principle, acceptance for A16 funding should make applicants more attractive for later stage funding, as the encouraging figures in Table 3.5 above bear out. The investor community needs to be made more aware of FIWARE and its potential, to ensure their continued interest now that the FI-PPP funding has ceased.

3.5.4 Beyond the FIWARE Community

Clear synergies have been created at regional, national, European and international levels. This is most obvious in the Smart City domain where FIWARE has been able to position itself as a vendor-neutral platform for building and sharing portable and interoperable smart city solutions that are replicable worldwide. In smart agrifood and smart industry, too, synergies are emerging. In each case, a whole value chain approach is being pursued. The results at national level are less encouraging: only in Germany (*Smart Service Welt*) and Austria (*IKT der Zukunft*) has FIWARE been accepted and promoted within national programmes. Efforts have been made to engage stakeholders outside Europe, so as to make FIWARE truly global, and again it has been the Smart City arena that has seen most success.

FIWARE is being adopted as a de facto standard at European and global level. In areas such as smart cities, the lack of common standards presents a major bottleneck holding back economic development and growth. While many proprietary systems are available, lack of interoperability is an obstacle: this is especially the case in the smart city context where existing systems have been

²⁵ Collaboration announced by ATOS, Engineering, Orange and Telefonica at the Mobile World Congress in Barcelona in March 2015. <http://tinyurl.com/pkqndya>

developed within vertical silos. The FI-PPP has sought to work with global partners to identify where interoperable standards are advancing sufficiently to speed the uptake of smart solutions. FIWARE's NGSI standard API has proved to be one of the most advanced examples in this respect and is being adopted and recognised by leaders and influencers in a number of key markets. FIWARE is being adopted as a de-facto standard in various sectors, most notably smart cities, through support and partnerships with organisations such as OASC, TM Forum, IES-CITY and GSMA. The current status of these initiatives is described further in Section 5.

Synergies with other European Programmes. The FI-PPP collaborated with CEF Digital, a programme under the Connecting Europe Facility (CEF) supporting the establishment of trans-European digital infrastructures that contribute to the Digital Single Market. This led to eDelivery, a CEF component for secure data exchange in trans-border digital services, being integrated into the FIWARE platform and further collaboration is being explored. Other examples are two recently launched large-scale pilots, IoF2020 in the agri-food sector and SynchroniCity in the Smart City sector, which make use of FIWARE as their open platform for service development.

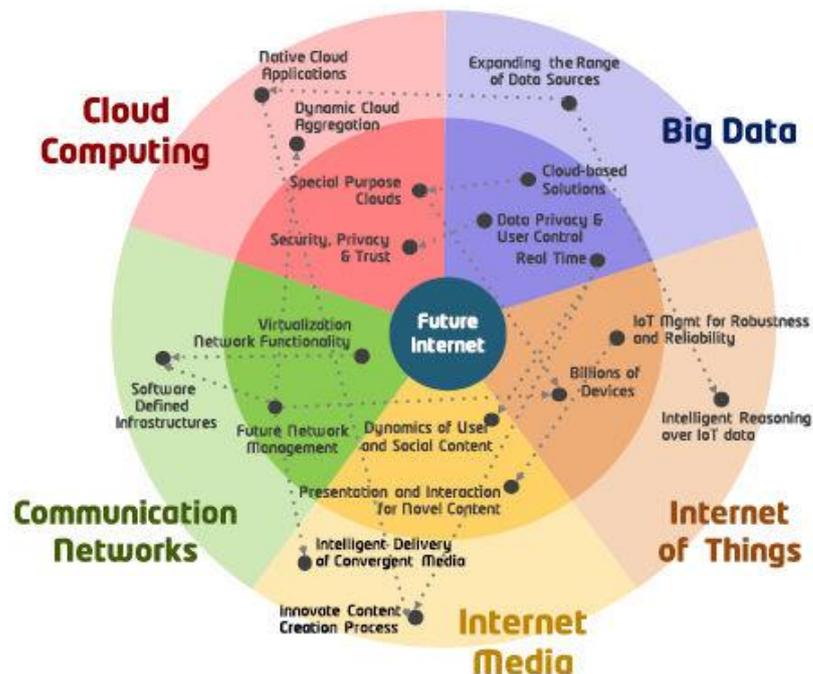
4. THE FI-PPP IN PERSPECTIVE

4.1 Strategic Objectives and Strategic Positioning

The digital world has changed significantly since the FI-PPP was conceived almost ten years ago. Computing power and storage have become more abundant, affordable and powerful. There has been an explosion of data (public and private, structured and unstructured) from a variety of sources, in particular sensory data. Cloud services have become part of everyday life, heralding an ‘everything-as-a-service’ era. The Internet of Things (IoT) is now a reality, with already billions of smart devices generating and communicating information. The convergence of these developments is boosting other technologies, such as data analytics, artificial intelligence and automation. New digital products, services and industries are shaping today’s economies, markets and services.

FIWARE remains highly relevant to the new opportunities brought by digitisation. The five areas that have been the focus of FIWARE development – cloud computing, big data, IoT, media internet and communications networks – have become more prominent and grown in strategic importance, bringing opportunities for new digital jobs and skills. The technological areas targeted by FIWARE are deeply intertwined and cross-dependent. Some challenges (those closer to the centre in the Figure below) are expected to be solved in a short-term timeframe (up to 2020); others will take longer to address. Meanwhile, further attention is needed also to the behavioural, organisational and business issues that are driving adoption and usage of Future Internet technologies.

Figure 4.1: Areas of Future Internet Development



Source: FI-LINKS²⁶

The PPP has maintained its relevance by being highly adaptive. The FI-PPP has ridden the technology trends that have shaped, and continue to shape, the digital world. Rather than being made obsolete by changes in the external environment it has maintained its relevance by being highly adaptive. The FIWARE offer – based around a set of open, re-usable and interoperable technology components – is highly attractive in today’s multi-platform world. Already companies and entrepreneurs are finding FIWARE a viable platform on which to build innovative Internet

²⁶ FI-LINKS Roadmap v2.0 and Specific Focus Releases, FI-LINKS Deliverable D1.3. <http://fi-links.eu/public-deliverables/>

applications and services. As such the goals of the programme remain highly relevant for Europe and the FI-PPP continued to offer significant business value throughout its lifecycle.

Openness remains FIWARE's key strength and must be guaranteed. The emphasis throughout has been on an open approach. Open systems provide defence against vendor lock-in, allowing software applications to be customised and significantly lowering the barriers to entry for businesses and start-ups. The pursuit of a public, royalty-free and implementation-driven approach helps to remove commercial and technical barriers, offering start-ups and developers platforms and tools in areas with strong growth potential. Open platforms are particularly important in the context of the open data agenda, where public sector and other data are used as a spur to service innovation, for example in smart cities. As a B2B middleware based on open standards, there are opportunities for FIWARE across all market sectors, with important niches initially in three key verticals (smart industry, smart agriculture and smart cities). However, developments within the Foundation raise concerns as to the extent to which openness can and will be guaranteed in future (see Section 5 below).

The FI-PPP has substantially achieved all of its original objectives. The Programme has made clear, and in many cases dramatic, progress against the original Strategic Objectives set for it. Considering each of these in turn:

- 1) **Objective 1: Develop innovative open source technological platform components** which accelerate the development of innovative services and applications, reduce cost, standardise and allow for interoperability and portability. The FIWARE platform is a rich suite of components that implement open standard APIs, typically offered 'as a Service'. Core components of the FIWARE platform enable developers to build smart, innovative applications for the new digital era. FIWARE responds to the challenges in many sectors, facilitating connection to the Internet of Things, the processing and analysis of contextual information in real-time and on a large scale (big data), and the incorporation of advanced functions for user interaction. It offers a very powerful open source toolkit that addresses the demands of many current and emerging applications within the digital economy and society.
- 2) **Objective 2: Create a European innovation ecosystem around FIWARE and the concept of open service platforms.** The FI-PPP was conceived from the outset as an innovation ecosystem, rather than simply a research & development programme, and measures to foster and support this ecosystem have been central to the programmatic approach. The ecosystem support measures implemented have been highly innovative, most notably in seeking to engage with large numbers of SMEs and start-ups in using the FIWARE technology and allocating a significant proportion of the budget for this purpose. The legacy of these activities has been the formation of the FIWARE Foundation as the custodian of the FIWARE technology and community. Its creation empowers the FIWARE Community, including end-users, developers, investors and other stakeholders towards building a sustainable ecosystem for FIWARE in the future.
- 3) **Objective 3: Foster market take-up of FIWARE technology for smarter public service infrastructures and business processes.** Market take-up has been a core focus throughout the FI-PPP and was a key motivation behind measures such as quality certification, the large-scale trials, and business acceleration and support. There has been a range of success across these measures and overall the results are closer to the market than is the norm for EU RDI programmes. Already today, solutions built on FIWARE are being actively deployed in real-life systems across a broad range of sectors. Solutions built on FIWARE are able to scale across geographic areas, connect with a wide range of hardware and sensor technologies, and interoperate with all kinds of business systems and databases. Users in the public and private sectors are able to use FIWARE as the basis for smart solutions that they can continue to adapt and grow as they see fit. The FIWARE Foundation is a visible commitment of European businesses to bring more innovative internet services to consumers, citizens, businesses and the public sector. In addition, FIWARE has a

reasonable chance to become a de-facto standard for development of IoT-enabled smart services, putting it at the leading edge of a major global growth market.

We assess the extent to which the desired programmatic approach was achieved and how it could have been improved in our Conclusions in Section 6.

4.2 Strategic Impact

4.2.1 Programme Outcomes

The Programme outcomes already represent substantial benefits for Europe and further impact can be expected in the future. The EU invested around €300m in the FI-PPP which in turn leveraged a further €100m of direct financial contribution. The main outcomes can be summarised as:

- An **open service platform with distinctive technological advantages** and the credibility to compete in global markets.
- A valuable body of results in **key application sectors** accumulated through the use cases and large-scale trials.
- A ground-breaking experiment in using a **Europe-wide network of innovation accelerators and hubs to support SMEs, start-ups and entrepreneurs in using these technologies**, together with a substantive body of knowledge on good accelerator practices accumulated during this experiment.
- The **commitment of several major industry players** willing to embrace FIWARE and champion it within key market sectors.
- **An evolving ecosystem** of large companies, SMEs, developers, start-ups and users that is sufficiently committed to FIWARE to have formed an independent foundation to be custodian of the technology and community.
- **Commercial reference deployments of FIWARE-based solutions** worldwide across many sectors, with an especially prominent and promising position within the Smart City market.
- Increasing **recognition of the merits and advantages of FIWARE** within various forums worldwide, including adoption of the FIWARE platform as a de facto standard.

The outputs are significant and demonstrate the Programme's versatility. The outputs are more limited than those originally set out but, arguably, those that have been delivered are much more significant than could have been envisaged when the Programme was launched. The generic, multi-purpose platform foreseen at the outset was soon found to be unfeasible and contrary to market requirements. The heterogeneous open platform that evolved in its place, based on a suite of reusable, open source components, proved to be much more versatile. However, even this was too ambitious initially, leading to too much time being lost in developing a toolbox that was feature-rich but unreliable and poorly documented. Only in the latter stages was sufficient attention given to aspects such as quality, scalability and robustness that are key determinants of market success.

The use cases and trials were not sufficiently integrated into the Programme and produced limited results. The use cases and trials were intended as a way of exerting early market pull on the technology development. But the Programme was structurally unable to deliver key results to the use cases in a timely manner. For their part, the large-scale trials were unable to deliver robust results (in the form of specific enablers) or to leverage what was produced in a meaningful way. Thus, with some notable exceptions, the impact of the LSTs has not been as significant as originally intended.

4.2.2 Market and Economic Impacts

The market impact of the PPP is already tangible and potentially very significant. FIWARE solutions are becoming more mature and are already being applied in commercial applications

worldwide. Real-world examples can be found in sectors as diverse as manufacturing, e-health, smart cities, digital media, and environmental management. Among its other advantages, FIWARE has value as a fast prototyping environment in the development of new products and services. As an open platform it allows developers to respond quickly to customer demands and test out a broad range of concepts and approaches.

FIWARE holds significant potential for growth and job creation. The FIWARE focus areas are all strong candidates for future growth and offer significant potential for job creation. A socio-economic model developed by FI-IMPACT projects substantial economic and job impacts from the FI-PPP through to 2020. According to an IDC model, the funded enterprises' revenues (direct impacts) are projected to generate additional economic benefits for their sub-suppliers and business customers (indirect impacts), as well as for the economy as a whole through additional wages and spending (induced impacts). Under its baseline scenario, FI-IMPACT estimates the cumulative economic impacts for 2014-2020 as being around €28.3bn in cumulative revenues and 100k jobs. This compares with revenues of €17.5bn and 65,600 jobs under a 'pessimistic scenario'; and revenues of €41.7bn and 140k jobs under an 'optimistic scenario'. While not endorsing these forecasts, the Panel is of the view that FIWARE has the potential to create a positive economic impact. The timescales are, most probably, more long-term than the FI-IMPACT analysis suggests.

By lowering barriers to entry for start-ups FIWARE creates a favourable environment for innovation. In terms of the FI-PPP's contribution to research & innovation, the impact lies primarily in creating a different form of ecosystem around open APIs; an open source alternative to existing solutions that has engaged a large number of firms. The FIWARE open service platform has potentially lowered barriers to entry for start-ups and SMEs in high growth markets such as smart cities, digital health and digital manufacturing, facilitating the creation of a public good.

Measuring Impact

A proper assessment of the Programme's impact requires ongoing monitoring. Since the FI-PPP was not a standard R&D programme conventional criteria for measuring impact (publications, citations, patents, collaborations, etc.) do not apply. Similarly, macro indicators, such as numbers of new jobs, have limitations. Start-ups typically employ relatively few people but have high valuations and value added. They are also highly volatile in terms of lifecycle and survival rate. Thus, we have to look to other indicators and criteria: access to open data will be a success factor for start-ups in relation to smart cities, for example.

One study has estimated that by 2020 SMEs are expected to generate revenue of more than €330m per annum from the FIWARE platform.²⁷ By this time they would be serving at least 1.5m customers and reaching a market of more than 20 million consumers. While not wholly convinced by this analysis, the Panel believes that the returns will be positive, and certainly greater than would normally be expected to be generated directly for €300m of EU R&D expenditure.²⁸ It is crucial that market activity arising from the Programme, in particular the Phase 3 beneficiaries, continues to be monitored so as to be able to assess the impacts more accurately. Box 3.6 provides an example of the insights that might be obtained. **[Recommendation 4]**

²⁷ *Update of Impact Assessment and Forecast*, FI-IMPACT Deliverable D2.4.

²⁸ Quantitative estimates such as those developed by FI-IMPACT rely on assumptions regarding survival rate, scalability of survivors, spillovers, price effects, etc. that are highly sensitive and should be treated with caution.

Box 3.6: The Impact of IMPACT: A Case Study of Acceleration

Data released by the IMPACT accelerator, one of the original A16, provides insights into the fortunes of grantees since the formal monitoring activity ceased in June 2016. The following were published in a whitepaper issued by the IMPACT accelerator in January 2017. The analysis is based on information from 52 of the 63 start-ups who voluntarily reported their data.

- **Employment:** Average employees increased from 4.3 members per start-up to 6.4 members per start-up. The average increase was 2.1 employees per start-up, representing an average team growth of 49% over the six months acceleration programme.
- **Investment:** The average pre-acceleration investment was €193,000 (including some who had not received any funding), and the average reported investment during and after acceleration was €371,900. This included €100,000 awarded by IMPACT. Thus, the average start-up achieved more than €250,000 through other investors.
- **Start-up Valuation:** The minimum valuation before acceleration was €30,000 and the maximum was €4 million, with an average of €1,237,900. After acceleration, the minimum reported valuation was €200,000 and the maximum was €22,400,000, the average being €2,954,800. This means that the average start-up valuation more than doubled after completing the acceleration programme. In some cases, start-ups were able to achieve a valuation up to five times their pre-acceleration figure.

Source: IMPACT accelerator whitepaper, January 2017

4.3 European Added Value

The innovative nature of the FI-PPP means that its rationale is more complex than most R&D initiatives. During the Programme's initial phases the standard arguments about uncertainty and appropriability of knowledge could be said to apply. By the time of the Second Interim Assessment the rationale was found to rest in a market failure that affects the initial growth stages of an ecosystem. Network externalities were seen to apply which created an initial high risk for users or suppliers to commit when they were uncertain that others would adopt compatible solutions. More broadly, the same risk applies to acquisition of the necessary skills and knowledge as the individual may be inhibited from making the necessary investment of time and resources without the assurance that a labour market for the relevant skills would emerge.

Hence, early participants could be said to be engaged in higher risk and uncertainty but by doing so they would create benefits for future entrants by securing an open source platform that would better meet their needs than its commercial competitors through reduced costs and barriers to entry. Since such a system would be unlikely to succeed on a purely national basis, its development in a European programme provided additional security that FIWARE would become an international standard with the attendant benefits of easier achievement of critical mass and export opportunities.

The central question now is, given the nascent ecosystem the Programme has created, **at what point is it appropriate to withdraw public support?**

There is a risk that the timing of this withdrawal was determined by the budget horizon of FP7 rather than the needs of the ecosystem. In addition, the withdrawal may have been better tapered. A recent EU report notes:²⁹

“More precisely, deep technology companies that introduce market-creating products require large levels of investment before the expected technologies yield those new products. To a large extent innovation investments are associated with high sunk costs that will only be partially recovered, and hence cannot act as collateral assets for loans. In addition, market-

²⁹ *The Economic Rationale For Public R&I Funding And Its Impact*, DG Research & Innovation, Policy Brief Series, March 2017

creating innovations, by their very nature face a very important degree of market uncertainty, no matter how predictable the regulatory framework may be. Finally, accessing financing from the conception phase to the scale-up of innovation represents a challenge, given the high levels of technological and market uncertainty and information failures in capital markets and the financial sector to measure the associated benefits and risks.”

On the other hand it may be the case that additionality was low in that the advantages of the GEs would have attracted private investment to the start-up firms, or that major firms or other actors such as cities would have stepped forward to take responsibility for development and uptake. The successes of the accelerators in distributing grants and of the beneficiaries in using them do not in themselves provide sufficient justification. Evidence would be needed of later entrants being further assured of the advantages of the technology and ecosystem, ultimately in the absence of subsidies or direct policy incentives. Similarly, the beneficiaries should retain or increase their commitment in second-generation products. As yet it is still too early to say whether these last two criteria are being fulfilled and the absence of ongoing monitoring means we are not likely to get the necessary information. Information on use of FIWARE by firms and developers that did not receive a grant is also lacking and would help illuminate the two-sided market hypothesis.

The Accelerator Programme was a major market intervention that needed to be more carefully timed and planned. Clearly, the Accelerator Programme would not have happened without EU funding. It leveraged additional VC investment during the programme and subsequently. The investments were open and equity-free and were not comparable to anything on offer in the US or Asia. As the investment data shows, the Commission’s initial investment of €80m in the accelerators has been matched by market investments in the start-ups. On the other hand, the grants appear to have crowded out external investors in this field, at least temporarily. In market terms, the risk would be increased if the technology concerned was found not to be relevant or reliable by businesses. If public programmes are offering to subsidise the introduction of technology on a scale that disrupts normal investment activity, then they need to be assured that the technology is market ready. The evidence suggests that this was not always the case with FIWARE: more extensive and robust certification at an earlier stage would have improved the quality and reliability of the technology, ensuring that it was more accessible to start-ups and developers during the Accelerator Programme.

The national differences in uptake raise the question of whether the rationale for the Programme held up more effectively in countries where there was a deficient innovation finance set-up, or where there were more favourable demand conditions, or where there was reduced proprietary competition.

The achievements outlined in Section 3.5.4, in terms of synergies being created at regional, national and international levels and adoption of FIWARE as a de facto standard within various forums, further reinforce the Programme’s added value for Europe.

Attention should now shift to diffusion: what will drive the take-up of FIWARE in businesses? Where do the barriers lie in terms of skills, absorptive capacity, technological/vendor lock-in, and other factors? If the Commission is to use market-shaping incentives, such as specifying FIWARE content in future contracts or purchases, then a clear rationale will be needed, as well as a close look at competition regulation. We return to these issues in Section 5.3 in the context of the sustainability of FIWARE.

5. SUSTAINABILITY OF FIWARE

5.1 Markets for FIWARE

FIWARE has a world of opportunities. With the funded programme now finished, it falls to the FIWARE community to take the results forward and develop the market for FIWARE-based applications. At a technical level, there is nothing in FIWARE that makes it more or less suited to one market sector over another. As an open service platform comprising a rich set of open source components, many of which are certified, FIWARE allows developers to build any kind of internet service or application. Rather its uptake depends on market factors. Sectors such as aerospace, energy, banking and transportation, where systems can be mission critical, present huge barriers to entry for platforms with an open source pedigree. Yet more than 75% of Phase 3 companies either wholly or partially targeted B2B applications, some with disruptive intent, including in these perceived high-barrier markets.

The involvement of large players is critical for FIWARE to gain traction in new markets. The sectors where FIWARE has gained traction to date are characterised by having the support of at least one large industry player and/or by the wider community in Europe. The progress made in relation to smart cities, smart industry and smart agriculture has all been achieved, in large part, through the active involvement of sector players (see box). Sectors such as eHealth and smart ports offer equally attractive opportunities: it is simply a matter of finding partners ('sector champions' in effect) to drive adoption forward. Prospects in these markets would be improved significantly if a key player in the field were to take the lead in adopting FIWARE. The FIWARE Foundation can be an evangelist for the technology but the involvement of key players is critical.

The Foundation's strategy to focus on three key verticals should be pursued rigorously. In the meantime, the Foundation is playing to its strengths, prioritising activities in smart cities, smart industry and smart agriculture, each of which now has its own interest group ('Technical Committee'), while being opportunist towards other sectors. This is a well-chosen strategy by the Foundation and should be pursued to its logical conclusion.

Box 5.1: Lead Adopters for FIWARE - The State of Play

Smart Cities

FIWARE is recognised as offering an attractive platform for smart city solutions and is already being used in many cities worldwide. To date, more than 100 cities from 23 countries in Europe, Latin America and Asia-Pacific have officially joined the Open & Agile Smart Cities initiative which is promoting the adoption of open service platforms, one of which is FIWARE, in smart cities. Reference cases are available online.³⁰

The prospects for FIWARE are not inherently better than for other platforms being offered for smart city solutions; nor are they better in cities than in other markets. Essentially, FIWARE is doing well here because it has **first mover advantage**. The prospects are being enhanced significantly by standards based activity in various forums:

- FIWARE Foundation is working with TM Forum, a global business association for the communications industry, to co-develop a Smart City API Reference Architecture that enables portability and interoperability of smart city solutions. The initiative aims to unlock innovation in smart city services and grow the urban data economy. It builds on FIWARE's existing collaboration with TM Forum in relation to open APIs, which are now available as Business Framework components of the FIWARE platform.
- FIWARE Foundation has joined a new Industry Specification Group on cross-sector Context Information Management (ISG CIM) set up by ETSI, the European Telecommunications Standards Institute. The group will develop specifications for a common CIM API, data publication platforms and standard data models in order to achieve and improve cross-sector interoperability of smart

³⁰ See, for example, www.oascities.org and www.organicity.eu. OASC promotes the use of open, de facto standards as the basis for a market in smart city solutions and does not favour any particular technology platform.

applications. Beyond the initial focus on IoT-enabled Smart Cities, the cross-sector approach will be transferrable to applications in other vertical domains, such as Smart Agriculture and Smart Industry. The Group will work closely with other ETSI committees working on M2M and IoT.

- Building on its involvement in the Global City Teams Challenge, the FIWARE Foundation has become a partner in a new US-led initiative to create an Internet of Things-Enabled Smart City Framework.

As well as large cities, there are opportunities in smaller cities and towns that do not necessarily require a full platform approach. Smaller companies are well placed to provide this functionality and can also contribute to citizen engagement. Future opportunities include moves to integrate critical infrastructure and real-time services in smart city solutions, as well as more intelligent city management (the so-called 'autonomous city').

Smart Agriculture

Start-ups and SMEs are using the FIWARE open service platform to create new solutions that address challenges across the agri-food value chain. They have been adding value to this most traditional of industries by incorporating context-aware and Big Data management technology as an enabler for reorganising food systems, from the farm to the plate and to waste disposal processes.

Market conditions in agriculture are very challenging. Every farm is effectively a self-contained business unit. Farmers have to make their own investments and are suspicious of smart systems because of the fear of vendor lock-in. Meanwhile, the solutions offered by suppliers are becoming increasingly complex and expensive.

In recent years significant collaboration has been fostered in the smart agri space, leading towards sector standards and interfaces. FIWARE's interests are being promoted through the Foundation's Technical Committee on Smart Agriculture. There are also opportunities to broaden the relevance of the technology across the rural economy.

Smart Industry

The digitisation vision requires data to be collected, processed and shared across manufacturing value chains. Given the heterogeneity of manufacturing, this is extremely difficult in practice, requiring contextual data to be exchanged between many different types of applications and processes, including machine-to-machine and between physical and virtual objects. This can only be achieved through open APIs, neutral interfaces that allow existing proprietary solutions to be adopted and interconnected more easily.

Industrial Data Space (IDS) is an initiative of European manufacturing industry to realise this hyper-connected vision of digital manufacturing. It aims to establish a virtual data space which supports the secure exchange and simple linking of data in business ecosystems on the basis of standards and by using collaborative governance models. This virtual data space will be based on open source components and tools, one of which is FIWARE. From its origins in Europe IDS is now being promoted in several forums worldwide.

The FIWARE Foundation's Technical Committee on Smart Industry leads on FIWARE elements, liaising with the recently formed Industrial Data Space Association.³¹

The open source approach offers a key advantage in dealing with public sector clients (because of the desire to avoid vendor lock-in), hence giving FIWARE an advantageous position with cities and regions. Its European background is also likely to be an influential factor in European markets, where different values and priorities apply on issues such as privacy and ethics compared to elsewhere. Prospects in public sector markets are aided by access to open data; here, too, conditions in Europe are generally conducive as more governments provide free, open access to public sector data for commercial and social exploitation.

The opportunities for FIWARE in corporate markets are increasingly favourable. As the digital revolution takes hold, the impacts of digitisation are being felt across all vertical industries. Yet these companies have difficulties hiring developers and digital experts, and many are seeking to engage with, and in some cases invest in, start-ups as a means of accelerating their digitisation

³¹ www.industrialdataspace.org/en/

agendas. There are real opportunities here for the Foundation and the FIWARE community as a whole, but they will take time to bear fruit. Corporate leviathans move slowly and engaging them will take patience and persistence. As noted above, having champions from within the sector will be key.

Start-ups, too, have important contributions to make. Corporates can be reluctant to work with start-ups on public tenders because they are seen as too high risk: their innovative solutions may not meet the conditions regarding reliability, stability or security required under the contract. Yet such relationships will be essential for FIWARE to be accepted in commercial markets. The public sector needs the energy and innovation that start-ups and SMEs can bring and the contract terms should allow for this. For example, they could be asked to bring additional functionality to the system that is not necessarily stable, in areas such as user interfaces and localisation aspects.

The Foundation should be a broad church but must safeguard the openness of the FIWARE platform. There is potential for tension here between the public sector, which is likely to place a high priority on maintaining openness of the platform, and corporates, who may wish to customise FIWARE around their own offerings. The two groups will never have the same agendas and the Foundation will need to find means to allow the various stakeholders to follow their own paths. To be recognised as open a platform has to have not just royalty-free open specifications and code, but also open source reference implementations and offerings from multiple vendors. In allowing corporates to take too prominent a role there is a risk that FIWARE technology becomes increasingly proprietary, despite the open nature of the basic platform (see below).

5.2 Prospects for the FIWARE Foundation

FIWARE has an exciting new home. The FIWARE Foundation is the independent, non-profit association charged with supporting the continued growth of the FIWARE technology and community. Its mission is: “to build an open, sustainable ecosystem around public, royalty-free and implementation-driven software platform standards that ease the development of new Smart Applications in multiple sectors.” The Foundation aims to do this by promoting, augmenting, protecting and validating the FIWARE technologies, as well as the activities of the FIWARE community, and empowering its members including end-users, developers and other stakeholders in the ecosystem. Membership is open to both individuals and organisations with interests in furthering the FIWARE technology (see Box 5.2). By the end of 2017 the Foundation is set to have a staff of fifteen.

The Foundation was established in October 2016 by four Founder Members (Telefonica, ATOS, Orange, and Engineering) and it acquired the FIWARE technology and other assets from the European Commission at a handover in March 2017. The creation of an independent foundation to take ownership of research results is highly unusual in an EU context and another example of how the FI-PPP has broken the mould in terms of EU research & innovation programmes.

Box 5.2: The FIWARE Foundation

The goals and objectives of the FIWARE Foundation embrace five aspects:

EMPOWER

- Developers: To bring best-of-breed tools to write great code, manage the development process and benefit from quality validation processes.
- Users: To access great software easing the development of new solutions, making the best use of the, being able to provide feedback and benefit from large-scale testing facilities.
- Companies and other organizations: To build a powerful, sustainable and profitable ecosystem and marketplace.

PROTECT

- The FIWARE trademark.
- The compliance with the FIWARE Code of Conduct.
- FIWARE Technologies by ensuring they remain available as Open Source.
- The openness, meritocracy and transparency which guides the decision making.

PROMOTE

- The new technologies integrated in FIWARE, fostering their adoption as de-facto standards.
- The developers producing such new technologies.
- The offering built with or around FIWARE Technologies.
- The users of the FIWARE Technologies who build such offering.
- The FIWARE ecosystem as a catalyser for economic opportunities.

VALIDATE

- The label qualifying the Quality Assurance of the FIWARE Technologies.
- Organisations that own the expertise to validate “Powered by FIWARE” solutions, “FIWARE IoT-ready” devices or people/organizations capable to provide FIWARE development, integration, training and consulting services.

AUGMENT

- Increasing interfaces for connectivity.
- Bringing new enablers that extend the functionality provided by the FIWARE platform.
- Increasing use cases for new application domains.

The FIWARE Community comprises all individuals and organisations contributing to achieve the FIWARE Mission. It is not only formed by contributors to the technology (the open source community working on the FIWARE platform), but also those who contribute in building the FIWARE ecosystem and making it sustainable over time.

Membership is available in five categories:

- Platinum Member (PM): who, strategically committing to FIWARE, hold the key responsibility in managing the Foundation. Open to any legally established organisation, except non-profit.
- Gold Member (GM): legally established organisations committed to FIWARE having an active role in pursuing the FIWARE Mission. Open to any legally established organisation, except non-profit.
- PM and GM Strategic End User Member (SEU): A special level of membership, dedicated to companies and organisations who are actually users of FIWARE-based solutions, but not developers nor providers of FIWARE or FIWARE-based solutions.
- Associated Member (AM): Non-profit legal entities that do not fall under any of the categories above; and contribute to the FIWARE Mission.
- Individual Member (IM): Any natural person who contributes to the FIWARE Mission.

The Foundation is governed by a Board of Directors (comprising representatives of the membership), responsible for overall strategy, and a Board of Officers (comprising the executive officers), responsible for day-to-day operations. These are complemented by a General Assembly, an annual assembly of all members of the Foundation, and Technical Steering Committees where technical decisions are taken.

The Foundation has high quality location and personnel. A key focus in the discussions leading up to the launch of the Foundation was its location. After considering a number of leading cities around Europe, Berlin was eventually chosen. The Foundation is now co-located there alongside the EIT Digital Hub. The Panel considers this a sensible and logical choice, which has been backed up by highly competent appointments to the main leadership roles. Together, these two factors make the Foundation ably equipped to face the challenges ahead.

The Foundation has made a good start. While it is not in the Panel's remit to evaluate the Foundation, we have received – and been greatly reassured by – detailed briefings on its strategy and priorities going forward. The USP (as an open platform for developing smart solutions), target audiences (developers, start-ups and corporates) and market strategy (consolidating the position in the three key verticals while cultivating interest elsewhere) are all clearly defined. Globalisation and raising awareness in other world regions is also seen as a priority. Significant emphasis is being placed on ramping up communications through recruitment, a revised marketing plan, and external support. All of this activity, which is being approached with a sharp business focus, places the Foundation in a good position to make the most of the hand it has been dealt.

Deep engagement within the target markets. In terms of marketing, it makes no sense for FIWARE to attempt to compete in markets that are already very mature. Rather, it is seeking deeper engagement in markets in which it already has a strong toehold. Smart cities is an emerging market but also regulated and replicable, to a certain extent, from one city to another. Digital manufacturing and smart agriculture are also attractive, given FIWARE's inherited position in these sectors. In each case, the challenge now is in spanning the full value chain, primarily in terms of B2B but encompassing also services to the citizen/consumer. A 'FIWARE inside' type label would be very expensive and so unlikely to be effective. However, in certain markets, such as smart cities, the labels "*Powered by FIWARE*" solutions and "*FIWARE IoT-ready*" devices are being used.³² Effectively, the strategy is to position FIWARE as a B2B middleware that end-users (citizens, consumers, patients) may not be aware of but will benefit from through smart solutions.

Some within the Foundation see the absence of product companies and system integrators as a deficiency and are lobbying for their engagement. In the smart industry domain, medium-sized ('Mittelstand') companies are already being engaged. The involvement of NEC as a platinum member has opened up opportunities in Japan and strengthened the potential in smart cities.

Committed to an independent path. The Board is strongly committed to the independence of the Foundation, whereby it is able to survive without any public funding. The vision, in the words of one insider, is to build "a Red Hat-type company for FIWARE".³³ It was further explained that the need now was "to make FIWARE hot, interesting and sexy to developers", and as such any visible association with public funding would be counter-productive.

CIM activities are reaching critical mass. The interest being shown in FIWARE's context information management (CIM) functionality is especially promising. This is central not only to smart city markets, where most of the current interest is being expressed, but to virtually any application requiring a 'smart solution' (i.e. intelligent management of context in real time and at large scale). Taken together the current projects are approaching the critical mass necessary for CIM to become FIWARE's 'killer app'; a functionality or service it is able to deliver better than any other competing platform and with the potential to drive the whole FIWARE platform to the next level. The

³² The FIWARE IoT-Ready Programme is aimed at facilitating information from suppliers of IoT devices so that they can connect to applications based on FIWARE with minimal configuration (plug & play). The use of the platform in conjunction with FIWARE IoT-ready devices means that the development of solutions based on the use of sensors is a lot easier and developers do not have to face the complexity involved in studying and using different IoT communication protocols. At present around 20 companies are offering commercial devices and services labelled as FIWARE IoT-Ready (see <http://catalogue.fiware.org/devices>)

³³ Red Hat Inc. is a multinational software company providing open source software products and one of the main developers and distributors of the Linux open source operating system.

Foundation has also retained the services of Fraunhofer FOKUS Institute to perform further quality testing, which should further boost FIWARE's market credibility.

We wish to highlight the following as issues for attention by the Foundation:

- 1) **Development and maintenance of the FIWARE enablers:** At present the mechanisms for the future maintenance and development of the FIWARE technology lack clarity. Opinions within the Foundation appear to be divided between those who see corporates as having responsibility to develop and maintain the enablers; and those who wish to see developers playing an active role in developing the enablers and turning them into apps. As an operating system/middleware, frequent updates will be required, which assumes a critical mass of (independent) developers to work on the technology. The leadership here is unclear and requires clarification.
- 2) **Brand ownership:** The Foundation now owns the FIWARE technology and brand but the present arrangements – where responsibility for future development is vested solely in platinum members – carries a clear risk of 'corporate capture'. Concentration of development within a few corporate entities and rivalries between corporate members could compromise the independence and openness of the whole FIWARE platform.

Competing visions for the Foundation. These issues are manifestations of the same underlying problem: namely that there are two competing visions within the Foundation. One vision sees the Foundation primarily as a vehicle for large corporates, with developers and start-ups in support; the other sees it as an ecosystem driven by the needs of all of its stakeholders. This tension needs to be resolved quickly and transparently, so as to reassure the market about the openness of the FIWARE platform and the Foundation's role as guardian in its future development.

Overall, the Foundation has made a credible start but faces many challenges in terms of sustainability and future growth. Quality is still of concern and over the longer term the viability of the final products within the market is still open to question. Furthermore, for start-ups the competitiveness of FIWARE against existing solutions is not yet proven. A coherent strategy is needed that addresses these issues so as to ensure that the technology and community continue to evolve. The Foundation appears to have such a strategy, as well as very smart people, and is well placed to meet the challenges ahead.

5.3 A Conducive Policy Environment

FIWARE represents a response to the transition arising from the convergence of major technologies such as cloud, mobile, IoT and big data. As such, it offers significant added value for Europe: but only if it becomes sufficiently mature to support commercial offerings and a critical base of users is established. The FIWARE Foundation is effectively a start-up that is aiming to disrupt multiple established industries. It cannot be expected to do this on its own: further support mechanisms will be needed, not necessarily financial, to smooth its path and reduce the risks for firms in using/purchasing the technology.

Public policies, in both research & innovation and other domains, can help in this respect. Advances have been made during the EU funding and since. The promotions through CEF Digital and the NIST Global City Teams Challenge have already been highlighted, as has the use of FIWARE within two of the IoF2020 large-scale pilots. Standards-based activities are also being pursued in various forums (see Box 5.1).

On-going support is already being provided through four follow-on H2020 projects that aim to further develop various aspects of the FIWARE ecosystem:³⁴

³⁴ The FIWARE Foundation is the coordinator of FI-NEXT and a beneficiary in the other three projects.

- 1) FI-NEXT aims to put in place measures to maximise the potential of FIWARE by: i) extending its global reach; ii) improving quality standards and technical support; iii) advancing standardisation activities; and iv) ensuring FIWARE Lab as a self-sustainable environment. (total cost €9.0m with EU grant of €6.0m)
- 2) FI-GLOBAL aims to build and support a global open community of FIWARE innovators and users and mobilise a truly global marketplace of FIWARE applications. Among other activities, it will set up a FIWARE Masters Course to educate developers and establish international cooperation. (total cost €1.7m with EU grant of €1.4m)
- 3) IMPACT GROWTH is an accelerator that aims to identify four European Superstar start-ups confirmed by top VC investors and global corporates as having very significant growth potential (see Box 3.6). (total cost €6.7m with EU grant of €6m, plus €6m of additional private investment is being targeted into the beneficiary companies).
- 4) frontierCities2 is an accelerator targeting smart cities. It responds to the strategic opportunity to take FIWARE deployment in European cities to another level, building on the expanding network of 45 cities currently trialling or deploying FIWARE-enabled solutions. (total cost €3.0m with EU grant of 2.7m)

A more concerted top-level push is needed to ensure that awareness of FIWARE is maximised beyond the existing ecosystem created under the FI-PPP. Opportunities abound across the spectrum, from innovation-based initiatives under the H2020 work programmes and other PPPs, to economic development activities under the ESIF³⁵, and innovation-led public procurement. To date, support within national/regional policies has been limited, partly because public bodies are reluctant to 'endorse' one technology over another. This is one of the reasons FIWARE has directed so much effort towards standardisation activities, efforts which are now being intensified by the Foundation. Training and skills is also a potential focus for support. **[Recommendation 5]**

³⁵ European Structural and Investment Funds (ESIF) are the EU's main funding programmes for supporting growth and jobs across the EU.

6. CONCLUSIONS

Our conclusions address the FIWARE Programme at two distinct levels. Firstly, we summarise our key findings regarding the Programme's performance under Phase 3 and the current status of the FIWARE technology and community as they are handed over to the FIWARE Foundation. Secondly, we offer a retrospective on the FI-PPP experience as a whole in terms of implementation, achievements and impact.

6.1 Performance under Phase 3

The Panel finds that:

- The FIWARE platform has distinctive features and capabilities that give it real business value within the marketplace. As an open platform for smart solution development, it is applicable across many sectors and is well positioned to take advantage of emerging opportunities.
- FIWARE's capabilities in context information management (CIM) have emerged as one of its most significant technical achievements and a distinguishing feature within the marketplace. Pragmatic and valuable efforts have been made to capitalise on this which are being taken forward by the FIWARE Foundation.
- The Accelerator Programme was valuable and highly innovative. The diversity of models and approaches employed has provided a valuable knowledge base for future initiatives of this kind.
- The sub-granting process succeeded in attracting high quality applicants and offered companies favourable terms compared to what is available on the open market. The grants provided were a significant addition to traditional start-up and early stage funding in Europe: equivalent to at least 10% of these markets in FIWARE-related areas. Considering the thousands of business ideas submitted to the Accelerator Programme, the FI-PPP Phase 3 was one of the most important seed funding sources in Europe in recent years.
- The Programme Support Actions generally performed well and generated useful insights and tools.
- An innovation ecosystem was established around FIWARE, including an active community of SMEs, start-ups and entrepreneurs, but has yet to reach critical mass.
- Communications activities were of a very high standard for a European RDI programme but the messages were still not sufficiently focused in business terms.
- FIWARE has achieved notable successes at national, regional and international levels that provide promising indications for the future. Prospects in Smart City markets are especially encouraging.
- Many Phase 3 beneficiaries continue to perform strongly and some have received additional investment. The EU's initial investment in grantees has already been matched by the additional investments received. Furthermore, beneficiaries show a strong bias towards B2B markets, which is well aligned with future business opportunities.

However, the Panel also finds that:

- Insufficient progress was made in ensuring a rigorous quality assurance regime around the FIWARE platform during Phase 3 and quality management remains an issue.
- The Large-Scale Trials had limited visibility during Phase 3 and were not sufficiently supportive of the Accelerator Programme, and in general their follow up has been weak.
- Although industry players were re-engaged to some extent during Phase 3, industrial involvement remained at a subcritical level given the importance of large corporates as pathfinders for FIWARE-based solutions in key markets.
- Sustainability planning was uncoordinated and poorly managed across the Programme.

- Prolonged delay in establishing the FIWARE Foundation created a communications vacuum that contributed to market uncertainty about FIWARE's future prospects.
- The lack of on-going monitoring is hindering a longer term view of Phase 3 achievements.

Several of these issues are elaborated further in the programme-level discussion below.

6.2 FIWARE: Innovations and Achievements

From the outset, the FI-PPP was conceived as a fully integrated programme. Although the programme architecture comprised several separate components, it was mandated that the FI-PPP activities should be implemented in a highly coordinated way, with strong interdependencies between the various elements. Thus, FI-PPP projects were expected to collaborate proactively, manage their dependencies, and synchronise their activities under common FI-PPP collaboration and coordination structures set up as part of the programme governance.

We offer below overall observations on the constituent elements and the programmatic approach, while the box summarises the more innovative aspects of the programme's implementation.

Breaking the Mould: Programme Innovation within FIWARE

Innovation and flexibility have been hallmarks of the FIWARE Programme throughout. In many respects, the FI-PPP broke the mould in terms of what an EU RDI programme should be and how it should be run. The fact that the name of the programme itself was changed mid-term, from the bureaucratic sounding 'FI-PPP' to the more market-friendly 'FIWARE', shows a flexibility of mind that is unusual in EU circles and did much to gain the confidence of stakeholders. Innovations introduced under the programme in terms of how it was implemented and managed included the following:

- Use of **independent technical experts to certify the quality of the FIWARE components** and their reference implementations, which has helped to build credibility in the marketplace.
- **A highly professional approach to communications.** Adoption of FIWARE as a single brand covering all results and services, a professionally-managed Press Office, and a strong online presence all helped to present a unified view of the Programme to the outside world.
- **A highly innovative Accelerator Programme** designed to support SMEs, start-ups and developers in experimenting with and deploying the FIWARE technology. As an ecosystem support measure, the Accelerator Programme was highly unusual within European RDI programmes in terms of both the mechanism used (grant-funding to third-party beneficiaries) and the scale reached (more than 1,000 grants funded).
- Within the Accelerator Programme, **application of a wide range of business acceleration models and approaches:** accelerators were encouraged to experiment rather than follow standard procedures, creating a real life laboratory around FIWARE.
- Implementation of the **VIP Programme providing focused support to a small number of start-ups** identified as having high potential for success. In effect, the VIP Programme mirrored the workings of the VC market in a highly realistic manner, albeit to a relatively small number of sub-grantees seen as 'FIWARE Champions'.
- Use of **independent experts to oversee the effective and efficient implementation of the Accelerator Programme.** Their role went much further than that of traditional 'project reviewers' and they were more proactive: the experts acted as mentors to the individual accelerators, as well as helping to share experiences across the A16 network.
- **Dedicated efforts to promote the technology at global level.** International activities started at an early stage and were eventually brought together under a distinctive FIWARE Mundus brand.
- **Creation of an independent Foundation** to take ownership of the technology and move it forward.

6.2.1 Reflections on Programme Components

The Technology Foundation and Infrastructure

The FI-WARE technology development activities overcame initial hurdles and successfully reoriented around market needs. The original technology strategy, based on an open multi-purpose core platform, was too ambitious and lacked focus. It resulted, for a while, in an overcrowded catalogue of poorly documented software components, many of dubious quality. This situation arose partly out of the high priority given to corporate R&D departments, with a strong research orientation, during the programme's early stages. The initial technology development activities were too isolated, with insufficient linkages to and inputs from users (represented at that stage by the Use Cases). To their credit, the partners recognised the problems and were able to successfully reorient the programme around the open, modular service platform that better reflects market needs. However, valuable time was lost in making this adjustment which more effective governance could have prevented.

The infrastructure projects were largely ineffective and should have been better defined. The infrastructure support projects (INFINITY and XIFI) were expected to maximise synergies with infrastructural developments outside the FI-PPP. Their effectiveness in meeting this objective is difficult to assess. They achieved limited visibility as an external face of the FI-PPP and have left little by way of legacy. Under future initiatives such horizontal activities should be very carefully defined.

The Use Cases and Large-Scale Trials

The LSTs were not sufficiently integrated within the Programme and their impact has been limited. The UCs and LSTs helped to validate the FIWARE generic enablers with respect to the requirements of certain major user sectors. However, they lacked strategic capacity and were not well integrated with the rest of the Programme. Their potential customer role was never developed sufficiently and, as noted above, their inputs under Phase 3 were especially weak. For much of the Programme the UCs and LSTs remained on a parallel track and hence their impact has not been as significant as originally intended. The LSTs' arms-length relationship limited the Programme's articulation into traditional sectors, such as energy, healthcare, manufacturing and logistics, which could benefit substantially from FIWARE. Sustainability planning was also poor and their results are not being leveraged. The Programme was slow to identify the issues and in the meantime important opportunities were lost. Action is needed to re-engage the LSTs and, to the extent that they still have value, exploit their results.

The Accelerator Programme

The Accelerators were an innovative concept that evolved as the Programme progressed. The term 'accelerator' was not actually used in the original Work Programme under which they were selected: WP 2011-13 referred simply to "Expansion of Use Cases" through a set of "projects with participants that can rapidly connect to existing communities of small and innovative ICT users and developers". Only later were the selected projects referred to as 'accelerators', reflecting the approach used in the start-up world. This shows the evolution in thinking as the programme progressed.

Once launched, there were different expectations of the Accelerator Programme: FIWARE saw it as a means of developing the technology and growing the ecosystem, whereas the accelerators themselves were more concerned with growing individual companies. These dual objectives had synergies but also created conflicts. In retrospect this was justifiable provided the companies benefited from the approach (which appears to have been the case) rather than were harmed by it. Although there is little evidence that the sub-grantees contributed to the development of the enablers, they trialled a huge variety of applications and services based on FIWARE components. Essentially, the value of the Accelerator Programme was in developing the technology and the ecosystem, with business growth as a side impact.

The Accelerators were a valuable experiment in different intervention modalities. The operationalisation of so many different models toward the same objective was highly innovative and the extensive and close monitoring of their activities has generated a valuable knowledge base for future initiatives of this kind. The accelerators successfully converged towards common practices and benefited from mutual learning. The balance struck between SMEs and start-ups was broadly appropriate. However, the A16s' support to SMEs did not sufficiently benefit from the potential of the LSTs and in certain sectors (such as manufacturing) opportunities for FIWARE suffered as a result.

The sub-granting process was well implemented, attracting a large number of high quality applications across the EU and beyond. The number and distribution of funded proposals reflected the different strategies of the accelerators as well as national circumstances. However, sub-grantees were not always committed to FIWARE and the accelerators did not enforce this as a condition as fervently as they should have done. Few of the A16 offered additional technical support in the use of FIWARE, a gap that, if addressed, might have led to greater uptake. On the other hand, beneficiaries' strong bias towards B2B markets refutes fears that the funding would only attract start-ups interested in high profile consumer markets: this is especially positive in view of FIWARE's goal as a B2B middleware platform (see below).

The Programme Support Actions generally performed well but their experiences are not being fully exploited. The Phase 3 PSAs produced useful insights and tools. However, they would have benefited from a more joined-up, programme-focused approach. Furthermore, opportunities to draw on the PSAs' substantial and very valuable experiences in supporting the Accelerator Programme are not being fully exploited and should be addressed.

6.2.2 The Programme Approach

A programmatic approach was clearly evident but was not enforced sufficiently in all areas.

- **The reliance on traditional FP7 instruments constrained the effective implementation of a true programmatic approach.** Projects were selected primarily according to traditional FP evaluation criteria which focused on the excellence of individual proposals rather than the cohesiveness of the portfolio as a whole (e.g. synergies between candidate projects, contribution to the wider ecosystem, balance of geographical representation, etc.). Issues related to this arose during both Phase 1 (selection of the Call 1 CSAs and horizontal actions) and Phase 3 (selection of the accelerators). Special Clause 41 regarding programme coordination, which forms part of the grant agreement, relates only to the activities of projects once selected and operational: it is not, by itself, sufficient to enforce the programmatic view at the project selection stage. Alternative mechanisms are needed.
- **Ineffective governance led to drift and inefficiency during the early stages:** Although not unprecedented, the six-year time frame of the FI-PPP (one year longer than originally intended) is unusual for European RDI programmes. Such a long-term activity calls for strong governance, efficient management, and responsive leadership. In the early stages of the Programme these qualities were not readily apparent: previous assessments highlighted, in particular, ineffective governance as the cause of a number of initial problems. Despite subsequent changes to the governance arrangements, there were still significant knock-on effects in terms of the programme's efficiency and coherence.
- **The six-year timeframe was long in market terms and could have been compressed.** In internet time six years is an eternity. The involvement of start-ups under Phase 3 was planned in 2009/10 but by the time what became the Accelerator Programme was implemented in 2014/15 the market context had changed significantly. Around 80% of the sub-grantee businesses did not even exist when the FI-PPP was launched.

As it turned out, the Accelerator Programme came at roughly the right time. It exposed the FIWARE technology to large-scale testing and market validation at an appropriate point in the programme's lifecycle. But without the initial delays, the technology would have been

delivered earlier, providing less opportunity for effective validation by users (especially in view of the weaknesses in the LSTs). Thus, had everything gone to plan meaningful market testing could have been undertaken earlier and the whole Programme compressed by up to two years.

- **Quality assurance has helped build market credibility but should have been addressed earlier.** The decision to seek verification of the quality of FIWARE components from an outside agency was unusual – and possibly unique – for an EU RDI programme. The involvement of a third party to undertake systematic quality assurance has assisted greatly in building credibility for FIWARE within the marketplace, in both large and small companies. However, the importance of quality for market success was not appreciated early enough and was not pursued with sufficient urgency or rigour. This has left the Foundation with a lot of catching up to do in ensuring a fully-certified FIWARE Catalogue.
- **Industry players have not been pursued with sufficient vigour but are still critical to FIWARE's success.** Having lost the support of several of its initial industry stakeholders, the FI-PPP has struggled to re-engage with industry players. Those that have been involved have had a profound impact, not least as Founder Members of the Foundation. The active and competitive involvement of large players is critical for FIWARE to gain traction in new markets. It will underpin the openness of the FIWARE platform, provided the pool of platform providers is sufficiently diverse. The Foundation recognises this and is seeking to (re-)engage with industry. However, the concentration of future development within a few Platinum members represents a risk. A wider pool of corporate members actively involved in developing the FIWARE technology and ecosystem is urgently needed in order to avoid the perception of corporate capture.
- **The ecosystem around FIWARE is embryonic but has significant growth potential.** One area where the programme approach has been evident and highly successful is in establishing the ecosystem around FIWARE. More than 8,000 SMEs, start-ups and entrepreneurs applied for grants and many more were touched by FIWARE's promotional campaigns. Of these, more than 1000 had direct exposure to the ecosystem through grant funding. This is small in global terms (which emphasizes that ecosystem building is a long-term activity) but still significant by the standards of EU programmes. In particular, stakeholders in Central & Eastern Europe and in the European investor community were successfully engaged. Moreover, the ecosystem achieved global reach, thanks to dedicated measures to promote engagement from outside of Europe. On the other hand, the iHubs network was not successful in establishing a network of FIWARE digital innovation hubs, largely because of a lack of focus in its objectives.
- **Sustainability planning was slow and lacked the necessary coordination.** The difficulties in planning for the future of FIWARE post EU-funding were underestimated. The formation of the FIWARE Foundation took much longer than intended, for a variety of reasons, and the prolonged delay created a communications vacuum that led to uncertainty both internally (within the Programme) and externally (in the wider marketplace). Meanwhile, the LSTs' attempts to pursue their own parallel sustainability initiatives were largely unsuccessful due to their inability to mobilise the relevant communities. Warnings on these issues made at the time of the Second Interim Assessment were not heeded. A clearer path in establishing the Foundation would have enabled greater impact when it eventually arrived and a more coordinated approach on the part of the LSTs would have guaranteed their legacy.
- **The lack of ongoing monitoring is hindering a longer term view of the Programme's achievements and impact.** The tracking of Phase 3 beneficiaries after the completion of their grants would have had significant added value and the fact that a longer term monitoring effort was neither foreseen nor implemented is a significant shortcoming. It is still not too late to put in place a post-funding tracking mechanism.

6.2.3 Future Prospects

FIWARE is well positioned for the Digitisation Revolution: As a B2B middleware, inevitably the visibility of FIWARE will be constrained to some extent: it is unlikely to become as prominent in customer-facing solutions as GSM or 4G, for example. But this does not mean that it cannot and will not be successful. Indeed, there is now a broad consensus that the next phase of internet development lies in the business world, transforming traditional industries that have been largely untouched by digitisation up to now. A key focus is in connecting value chains in these industries from suppliers, manufacturers and service providers right through to the end-user/consumer.

Market confidence in FIWARE is growing by the day. Phase 3 beneficiaries continue to perform strongly and many have received additional investment. To date around 100 external investments have been recorded into FIWARE companies, ranging from a few tens of thousands of euros to millions. The total additional investments in FIWARE sub-grantees have exceeded €80m, meaning that the Commission's initial investment in the Accelerator Programme has already been matched. To have reached this milestone less than one year after the completion of the Phase 3 programme is a significant achievement and a vindication of the FI-PPP's whole philosophy and approach. The fact that market-savvy investors continue to back FIWARE with their own money attests to growing market confidence in the technology and its prospects.

The Foundation is pursuing deep engagement within the target markets and activities around CIM are reaching critical mass. The Foundation's strategy is to play to its strengths, focusing on the three key verticals where it has first-mover advantage (smart cities, smart agriculture and smart industry), whilst adopting a more opportunist approach towards others. Activities around CIM are reaching critical mass and could provide the USP needed for FIWARE to build a dominant position in many application sectors.

The Foundation has the right strategy but still has some way to go to become truly sustainable. Overall, FIWARE's strategy well matches current circumstances and it should be pursued rigorously. However, competing visions regarding the role of the Foundation in developing and maintaining the technology need to be resolved quickly and transparently, so as to reassure the market about the openness of the FIWARE platform. Uncertainties around quality assurance and the competitiveness against existing solutions also need to be addressed.

7. RECOMMENDATIONS

The Panel's forward-looking actions take two forms. Firstly, we identify specific actions ('Recommendations') aimed at maximising take-up and safeguarding the sustainability of FIWARE during the critical post-funding stage. In addition, we highlight issues from the FI-PPP experience of a more generic nature which could benefit future PPP-type programmes: these we call 'Learning Points'.

Several features of the programme provide important guidance for planning of FP9. The Lamy Report, *Lab Fab App*, has recommended that FP9 should adopt a mission-oriented, impact-focused approach to address global challenges.³⁶ The key lessons here hold strongly for that, for example the importance of strong leadership and governance, the need for a selection process that allows for a portfolio approach, and the challenge of securing both the engagement of large corporates to act as anchors while also maintaining a major role for new and disruptive innovators. FI-PPP also provides a valuable vanguard experience in planning for the innovation pillar of FP9, with its emphasis on successful engagement with start-up and scale-up businesses.

7.1 Ensuring the Take-up and Sustainability of FIWARE

Although the funded programme has come to an end, there are still many avenues open to stakeholders in exploiting the results and ensuring the sustainability of the FIWARE ecosystem over the medium to long term.

- 1) **Recommendation 1: Mobilise large companies as gateways into new markets.** Large players are critical to the future of FIWARE and need to be more broadly engaged. Their potential contributions go much further than avoiding vendor lock-in. They will: provide credibility, helping to reassure the market about the future of FIWARE and of the Foundation; deliver services, so ensuring a viable market for FIWARE technology; provide user-led testbeds for FIWARE applications; and help build the FIWARE ecosystem, including through promotion to their own value chains. Large players will also help secure the financial sustainability of the Foundation and can support start-ups in using FIWARE through corporate venturing. For all of these reasons, the Foundation should make a concerted and aggressive effort to bring large companies on board as partners, and ideally as fee-paying Platinum members. Broadening the base of large players within the Foundation would also safeguard the openness of FIWARE, deflecting concerns regarding potential corporate capture and appropriation of the technology.
- 2) **Recommendation 2: Re-engage with sectoral communities and stakeholders as the basis for opening up new markets for FIWARE.** The sectoral communities established under the Large-Scale Trials are an underexploited strand within the FIWARE ecosystem. In some cases the technical results are not sufficiently mature or robust to be the basis of viable business solutions. However, the communities themselves still represent an important asset: they are familiar with FIWARE and could greatly assist the Foundation as it seeks to open up new markets. These sectoral communities need to be re-engaged and mobilised.
 - *Opening channels to the Foundation:* The Commission should require the LSTs to cooperate with the Foundation in engaging with the sectoral communities established during the course of the FI-PPP. This should include requiring the LSTs to re-activate their websites, where they are no longer active, and for all such sites to be maintained for a further two years (to end of 2019).
 - *Building sectoral communities within the Foundation:* The Foundation should liaise with the LSTs in order to integrate their sectoral communities into the FIWARE ecosystem. Specific efforts should be made to engage: i) large companies as members of the Foundation and champions for FIWARE within key end-user sectors, such as energy and healthcare; and ii) SMEs and sector-focused start-ups as the basis for

³⁶ https://ec.europa.eu/research/evaluations/pdf/archive/other_reports_studies_and_documents/hlg_2017_report.pdf

sectoral communities within the Foundation (represented through new Technical Committees).

- 3) **Recommendation 3: Enhance the FIWARE quality assurance regime and make it more transparent.** The FIWARE Foundation should intensify the systematic quality assurance testing of FIWARE components by an independent external agency so as to ensure that all components within the FIWARE Catalogue are assigned quality labels by the end of 2017. In addition, the basis of the assigned quality labels should be made fully transparent.
- 4) **Recommendation 4: Implement longer term monitoring and impact assessment of the FIWARE Programme.** The European Commission should, as a matter of urgency, put in place measures to systematically track the performance of Phase 3 beneficiaries, as well as the wider FIWARE ecosystem. These activities should encompass direct follow up with companies through surveys as well as the use of third-party tools such as MatterMark, and should last for at least a further two years (i.e. to end of 2019). Wider aspects, such as the performance of the Foundation, contributions to standards, and contributions in socio-economic domains, should also be tracked. A further impact assessment should be produced at the end of this period, so as to inform a longer term perspective on the impacts of FIWARE. This would be especially timely in terms of the implementation of FP9.
- 5) **Recommendation 5: Shape a FIWARE-friendly innovation environment.** Although the EU funding has now come to an end, the Commission and other public actors still have an important role to play in creating an innovation environment in which FIWARE can prosper. Specifically, this should include (but not be limited to):
 - *Appropriate and consistent promotion of FIWARE through the Horizon 2020 Work Programmes (and its successor under FP9),* as well as other initiatives at European, national and regional levels. Further contributions of FIWARE within other public-private partnerships should be explored and appropriate implementation mechanisms put in place.
 - *Promoting training, skills development and mobility of personnel,* utilising instruments such as the ESIF and innovation platforms and initiatives within the Member States and regions.
 - *Promoting FIWARE in innovation procurement.* This could be appropriate in circumstances such as smart cities where there is a public purchasing authority. At a minimum, guidance could be prepared on how to give weight to the use of FIWARE in a specification, in accordance with state aid/WTO concerns.
- 6) **Recommendation 6: Capture and disseminate knowledge for policy learning.** The FI-PPP has been an experiment in the management of innovation, as well as a technology development programme with specific goals and objectives. With its strong innovation orientation and highly flexible approach to implementation, the programme provides valuable lessons for similar initiatives at both European and national levels, and hence can be a vehicle for policy learning. This experience could be especially valuable for the innovation pillar of FP9, where extensive engagement with start-up and scale-up businesses is foreseen. Notwithstanding the efforts already made, the European Commission should take further steps to capture the process knowledge accumulated over the last six years and disseminate it to services and agencies involved in designing or managing future programmes. In particular, accessible digests should be produced of the experiences of the A16 and the Phase 3 PSAs in managing and supporting the highly innovative Accelerator Programme and the lessons learned.

7.2 What Has Been Learned? Good Operational Practices from the FIWARE Experience

Our assessment has highlighted many areas where, with hindsight, improvements could have been made or things could have been done differently. There are opportunities to learn from these in

the way in which future European innovation programmes are implemented, especially ones involving business acceleration and/or large-scale grant funding.

We list below key learning points from the FIWARE experience. This is by no means a definitive list, however, underlining the need for more systematic efforts on reflective learning as outlined in Recommendation 4 above.

- **Learning Point 1: Strong and effective governance for the duration of the programme.** Public-private partnerships are highly complex entities with many competing interests. It is essential to have the right structures, the right people and the right processes and ensure the necessary mechanisms to adapt these quickly and effectively as circumstances change.
- **Learning Point 2: Instruments that meet the need for an integrated approach.** The pursuit of an integrated programme approach calls for appropriate instruments that are able to accommodate non-standard selection procedures and evaluation criteria. This may mean, for example, specifying additional/alternative criteria during project selection so as to reflect wider programme-level issues during the proposal evaluation process. Relevant coordination mechanisms are also required throughout all stages of implementation.
- **Learning Point 3: Stakeholders that really understand the programme goals and are committed to them.** This applies both to large enterprises as sponsors or prime movers, and SMEs/start-ups as beneficiaries of grant funding.
- **Learning Point 4: Flexibility and conditionality in the selection of accelerators.** The business acceleration/incubation portfolio requires balanced geographical coverage and the instruments used in selection need to reflect that. Typically, accelerators should involve established market players, understand the needs of start-ups in their sector, and follow a flexible approach. Strong links to professional services and institutional investors are key.
- **Learning point 5: Flexible support for grantees that reflects both business and programme needs.** Beneficiaries will have a wide range of needs and should be offered focused support according to set criteria. These criteria should balance the programme's objectives, such as to validate the technology and foster socially-oriented solutions, with the growth needs of individual businesses.
- **Learning Point 6: Use self-assessment tools** to help beneficiaries benchmark their performance. These should be backed up by in-depth support from expert mentors.
- **Learning Point 7: High quality communications, professionally delivered.** As an innovation programme, PPPs operate much closer to the market than a traditional research programme and must be prepared to engage on market terms. Communications must be of the highest quality and clarity. This is best handled by marketing professionals experienced in building and communicating a brand.
- **Learning Point 8: Independent oversight of the acceleration programme** by experts experienced in business acceleration and incubation.
- **Learning Point 9: Post-funding tracking mechanisms** should be built into the design of the programme so as to provide a long term perspective on achievements and impact.
- **Learning Point 10: It is never too early to start sustainability planning.** Developing a strategy for the future of the initiative post EU-funding is never smooth and is bound to take longer than anticipated. Yet this post-funding future should be in the minds of partners from day one. Developing a common view on sustainability from a very early stage will not only identify the ultimate destination, it will also help ensure more effective implementation.
- **Learning Point 11: Capture the experiences and lessons learned** during programme implementation. Again, specific mechanisms for this should be designed in from the outset rather than bolted on at a late stage.

ANNEX 1: OBJECTIVES OF THE FINAL EVALUATION

The objectives of the FI-PPP Final Evaluation are:

- 1) To assess the overall FI-PPP achievements, in particular the progress achieved since the Second Interim Evaluation (fall 2014) in terms of technological development and the mobilization of the key constituency. As this is the final evaluation, the overall FI-PPP should be assessed, with special detail to the planned objectives and their level of completion.
- 2) To assess the effectiveness of the sub-granting mechanism used in the third Phase of the FI-PPP to help and reach SMEs and web entrepreneurs, and to propose recommendations on how to more efficiently help and reach SMEs and web entrepreneurs for future programmes.
- 3) To evaluate the proposals provided during the 2nd interim evaluation on how to maximise the impact of Phase 3, measure their effectiveness and extract the lessons learned.
- 4) To evaluate the recommendations suggested during the Second Interim Evaluation on how best to follow-up the FI-PPP after its end in 2016. The evaluation should include alternative suggestions in order to maximize the results and the outcome of the FI-PPP. Follow-up recommendations on research and innovation topics in the area of Future Internet for Horizon 2020 (the European Union Framework Programme for Research and Innovation from 2014 to 2020) and also leverage results from the FI-PPP.
- 5) To assess the workings of the organisational model chosen and the processes which drove the PPP in its final years in view of general recommendations (lessons learned).
- 6) To recommend options for action by the different stakeholders, i.e. the FIWARE Foundation, ICT industry, public sector actors and the European Commission.

It is not foreseen that this evaluation will consider in detail the individual projects that have been funded under the initiative. However, consideration should be given to whether the portfolio of projects supported met the broad objectives set out for the FI-PPP.

ANNEX 2: COMPOSITION OF THE PANEL

Luke Georghiou (Chair) is Deputy President and Deputy Vice-Chancellor at the University of Manchester and also Professor in the Manchester Institute of Innovation Research at the Alliance Manchester Business School. He has chaired several international panels examining research and innovation issues including the First and Second Interim Assessments of the FI-PPP, two reviews of the European Research Area and a recent ERAC Peer Review of Research and Innovation in Spain. He was rapporteur for the influential report to European leaders, *Creating an Innovative Europe* (Aho Group report) which put demand-side innovation policy onto the political agenda.

He has an extensive list of publications including articles in *Nature*, *Science* and the *Harvard Business Review*. He is a member of the Academia Europaea and a Fellow of the Royal Society of Arts

- **Zuzana Nehajova** (SL) is former Director General for Innovation and Business Environment at the Ministry of Economy of the Slovak Republic. She currently acts as an Advisor to the Minister of Economy on Innovation and Smart Industry related topics.

In her previous role as Director General, Zuzana established the concept of Smart Industry in Slovakia, on the national level as well as part of its priorities as the Presidency of the EU. Promoting Public-Private Partnerships and close collaboration with all relevant stakeholders, she co-authored the Smart Industry Strategy for Slovakia, and has advocated support for clusters and up scaling and modernization of SMEs. Zuzana now leads a newly formed EY InnovEYtion Hub dedicated to helping companies of all sizes as well as public administration within the CEE region and beyond to adopt new technologies and trends, rendering optimization of processes and higher resource efficiencies.

With academic and professional background in law and financial management, Zuzana started her career in public administration at the Ministry of Finance of the Slovak Republic where she became Director at the Department of Financial Strategy for Economic Growth.

- **Rebecca Schindler** (DE) steers KPMG Germany's EU Evaluation Services. Rebecca brings 15 years of experience in designing, conducting and managing policy analysis research for a range of international clients in the private and public sector.

She has been a member of high-level expert groups, served as an adviser to tech start-ups (SMEs) and innovators, and co-authored multiple RAND reports and external publications on IoT, future internet, connectivity trends, cloud, smart X, big data, innovation and technology policy. Prior to joining KPMG, Rebecca held positions at the RAND Corporation, the United Nations University MERIT, the European Commission DG INFSO (now DG CNECT), and the universities of Paris, Strasbourg, and Maastricht. Rebecca graduated cum laude in Economics from Maastricht University (NL), magna cum laude in Sociology from Sorbonne University (FR).

- **Michael Sharpe** (Rapporteur) (UK) is a communications and strategy consultant specialising in technology-based sectors. He has over 20 years' experience in European research programmes and has worked extensively on policy, communication and evaluation assignments in the digital sector.

He has supported many boards, panels and high-level groups set up to advise on aspects of research and innovation policy. These have included: the Second Interim Assessment of the FI-PPP (2014); and *Future Internet 2020*, a Panel of high-level experts charged with producing visions on the Future Internet; as well as support for the Future Internet Assembly. Most recently, he provided secretariats for working groups set up under the

Digitalising European Industry (DEI) initiative; and the Interim Evaluation of the Active & Assisted Living Joint Programme.

Michael has extensive experience working with corporates, SMEs and public agencies on innovation-related issues, and is involved in several SME networks.

- **Graham Vickery** (AU) was formerly head of the OECD Information Economy Group, in charge of areas including information technology, ICT and environment, digital content, e-business, ICT skills and employment, country policy reviews and the OECD Information Technology Outlook. He is currently an independent consultant on ICT-related policy and policy evaluation. Recent activities have included chairing the European Commission's CIP ICT PSP Final Evaluation, as well as undertaking reviews of the re-use of Public Sector Information for the EC and OECD. He was a Panel Member in the First and Second Interim Assessments of the FI-PPP.

Expertise includes: public policy, information economy, environment, growth and employment, public sector information, intangibles and intellectual capital, new technologies, industry performance, and industry globalisation.

Author of numerous publications and articles on information technology, digital content industries, public sector information, business services, environment industry, globalisation, advanced manufacturing technology, information technology development and diffusion, technology and investment, high tech industries and work organisation.

ANNEX 3: QUESTIONS ADDRESSED BY THE PANEL

1. Relevance

- 1.1. Are the FI-PPP Programme technological developments (implemented through Technology Foundation, Technology Foundation Continuation, Use case and trials, Infrastructure support,) appropriate for developing key competencies across different areas to strengthen the competitive position of European industry in domains like telecommunications, mobile devices, software and service industries, content providers and media?
- 1.2. Are the FI-PPP Programme technological developments and their terms and conditions of use (implemented through Technology Foundation, Technology Foundation Continuation, Use case and trials, Infrastructure support) considered appropriate when analysing the overall FI-PPP programme?

2. Quality

- 2.1. Is the quality of innovation and research results satisfactory? What are the relevant indicators?
- 2.2. Have technological targets set in the FI-PPP Programme been achieved, notably the work programme 2012-2013?

3. Efficiency – Legal framework, Governance

- 3.1. Has the FI-PPP governance structure been appropriate? Have all relevant stakeholders been adequately involved in the FI-PPP Programme governance structures?
- 3.2. Were the targeted industrial and research communities involved appropriate? In particular, was the participation of innovators satisfactory?
- 3.3. Have programme key performance indicators been met?
- 3.4. What has the FI-PPP programme done to improve the innovation ecosystem in the sector?

4. Impact and Effectiveness

- 4.1. Has the FI-PPP Programme achieved its objectives?
- 4.2. Did the procedures contribute appropriately and effectively to deliver the objectives?
- 4.3. What can further be done to maximise the impact of the results achieved during the FI-PPP, in particular to increase the SME access rate to European Research Programme to develop innovative services upon the Future Internet technologies, to develop new business models being used by technology providers involved in the FI-PPP and to make business processes applied in the FI-PPP 'smarter' in several user domains?

5. European Added Value and Sustainability

- 5.1. Has the FI-PPP enabled projects that would not have been otherwise carried out at this scale (in terms of monetary/human resources)?
- 5.2. Has the FI-PPP helped its participants to reduce commercial or technological risk?
- 5.3. Has the FI-PPP contributed to the establishment of common standards at the European level?
- 5.4. Has the FI-PPP contributed to increasing the investments from industrial partners and other sources into certain areas of research and innovation?
- 5.5. Has the FI-PPP facilitated the enhancement of research capabilities/mobility of programme participants in the public/private sector?
- 5.6. How best to follow-up the FI-PPP after its end in 2016, in particular which recommendations on research and innovation topics in the area of Future Internet for Horizon 2020 (the European Union Framework Programme for Research and Innovation

from 2014 to 2020), (Work Programme 2016/17), that possibly leverage results from the FI-PPP?

For future: What potential has the FIPPP programme for job creation?

6. Strategy and Coherence

6.1 Internal coherence: were the right instruments used to achieve the objectives of the FI-PPP; did it address the right stakeholders? (sub-granting mechanism)

6.2 Overall coherence: how did the FI-PPP complement other activities; what are the synergies the FI-PPP has created at regional, national and European level?

6.3. Has there been good communication of objectives, progress, outcomes (products and services) and the approach and processes to open up new users and stakeholders?

What is the IPR strategy overall?

What is the balance between open platform versus proprietary solutions. Are we making start-ups competitive with open platform?

ANNEX 4: SUB-GRANTING AGREEMENT

Special Clause 42 in Grant Agreements under the FI-PPP specifies the following:

- **42. FINANCIAL SUPPORT GIVEN BY BENEFICIARIES TO THIRD PARTIES**

Where the implementation of the action requires giving financial support to third parties, the beneficiaries shall give such financial support in accordance with the conditions specified in Annex I, which shall at least contain:

- (a) the maximum amount of financial support, which shall not exceed EUR 60 000 for each third party except where the financial support is the primary aim of the action as specified in Annex I;
- (b) the criteria for determining the exact amount of the financial support;
- (c) the different types of activity that may receive financial support, on the basis of a fixed list;
- (d) the definition of the persons or categories of persons which may receive financial support;
- (e) the criteria for giving the financial support.

The beneficiaries shall ensure that the conditions applicable to them under Articles II.3 (n), II.9, II.12, II.22, II.23, II.42, and Part C of Annex II – General Conditions are also applicable to the third parties receiving financial support.

ANNEX 5: STATISTICAL SUMMARY OF THE PHASE 3 INITIATIVES

The centrepiece of Phase 3 of the FI-PPP was a set of accelerator projects aimed at engaging SMEs, start-ups and developers in using FIWARE technology. The accelerators offered grants for this purpose on a competitive basis through a series of open calls.

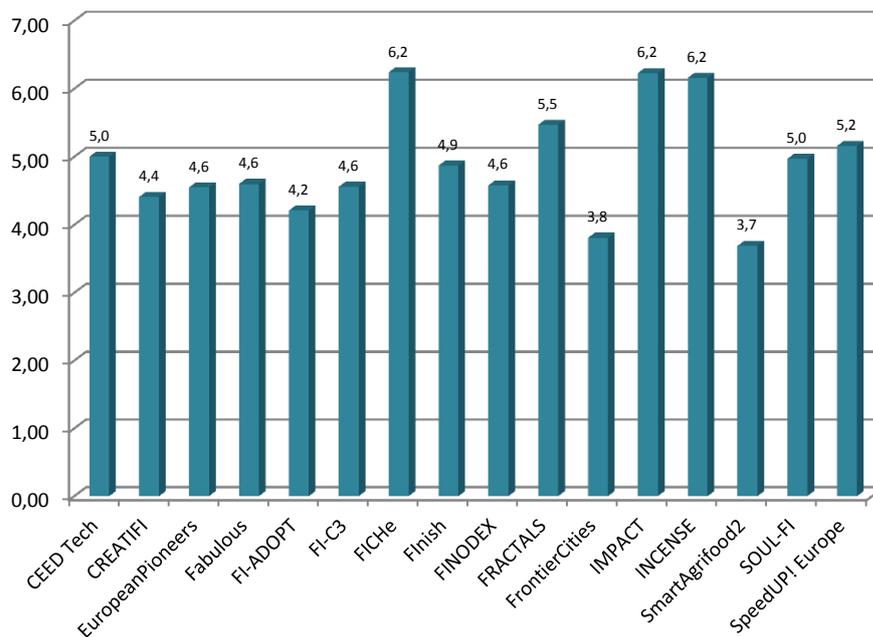
This Statistical Annex summarises the outputs and results of these Phase 3 initiatives, covering both the accelerators and the grant recipients ('sub-grantees'). The data is based primarily on the extensive, in-depth monitoring undertaken by FI-IMPACT, a Coordinated Support Action set up to monitor the accelerator programme as well as undertake impact assessment of the FI-PPP. The data were collected through various means – contractual information, surveys and self-assessment questionnaires – and the relevant sample sizes and reference points are stated in each case.

A5.1 The Phase 3 Accelerators

Sixteen accelerator projects were funded (sometimes referred to as the 'A16'), following a call for proposals, with broad geographical and sectoral coverage.

The A16 projects are shown in Figure A5.1, according to the EU funding available to external applicants. These ranged from €3.69m (Smart Agrifood 2) to €6.24m (FICHe), with an average budget for external applicants of €4.91m. In addition to the budget allocated to sub-grantees, the accelerators received a total of around €20 million for their own project costs, making the EU's total funding €100 million for the Accelerator Programme.

Figure A5.1: EC Funding per Accelerator, €m



The 16 Accelerators had a specific focus in terms of vertical industries or technologies targeted, and consequently selected and accelerated projects within their fields of expertise. The scope of each accelerator is described briefly below:³⁷

- **CEED Tech** was a consortium of five startup accelerators operating in Central and Eastern Europe. It has a network of 450 mentors in areas such as data, cloud services, analytics, fintech and e-commerce, B2B technologies, location-based services, and security software.

³⁷ Adapted from FI-IMPACT, Deliverable D2.4 Update of Impact Assessment and Forecast, pp.20-21

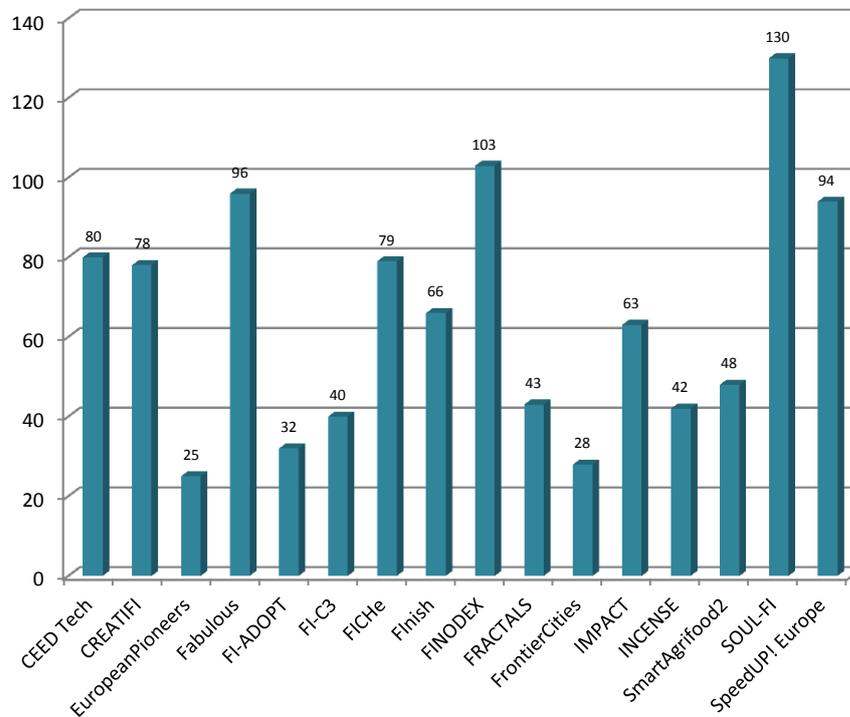
- **CreatiFI** focused on European creative industries and addressed the domains of media & content and smart cities.
- **European Pioneers** focused on the field of media in Europe and on the development of software applications enriching the media business landscape and improving media usage for end-customers as well as media suppliers.
- **FABulous** focused on 3D printing initiatives in the field of design manufacturing, logistics and content-based services.
- **FI-ADOPT** focused on corporate and citizen learning/training, healthy behaviour shaping and social integration purposes. Projects were expected to employ rich media, social networking, and mobile apps and gaming principles.
- **FI-C3** focused on three business domains: smart territories (smart city guides; smart city platforms; smart city services), media & content (multimedia augmented reality; transmedia/cross media devices; video games), and care & well-being (smart home; indoor position; personalized connected media).
- **FICHe** (Future Internet CHallenge eHealth) focused on the eHealth domain.
- **Finish** supported software applications for supply chains of perishable products such as food or flowers.
- **Finodex** focused on a wide range of business sectors: environment, health, transport, finance and others. Applications are open to European SMEs, individuals or groups of individuals up to four members.
- **FRACTALS** addressed the needs of the agrifood sector, with a specific focus on the Balkans and South-Eastern Europe.
- **Frontier Cities** aimed to identify high potential use cases for smart mobility applications, to provide on/offline support to ensure that SMEs are aware of cities interests, to provide technology advice and support to speed up application development, and to provide a full-scale market uptake and commercialization support program.
- **IMPACT** focused on mobile technologies such as mobile apps or business models based on mobility in the communications areas, social, video, media & advertising; design, education, entertainment, ecommerce, peripheral devices, content, connected TV, infrastructure, security, productivity, finance, smart cities and social networks, among others.
- **INCENse** (INternet Cleantech ENablers Spark) focused on the European energy and clean tech sectors, addressing the following categories: smart grids, automation solutions, energy efficiency, energy storage, electric mobility, and renewable generation.
- **SmartAgri Food2** initiatives focused on farmers and agricultural producers. Projects were expected to address one or more of three farming subsectors (Arable Farming - large-scale, Horticulture, Livestock Farming).
- **SOUL-FI** focused on real time information, open and crowd-sourced data and on the Internet of Things (IoT), with initiatives addressing the domain of smart cities and sustainable mobility.
- **SpeedUP! Europe** focused on the areas of agribusiness, smart cities and clean tech.

At least 80% of the project budgets of the A16 was reserved for the open calls. Accelerators were required to publish their open calls widely and adhere to FP7 standards with respect to evaluation, conflict of interest and confidentiality. Projects were also obliged to promote broad participation in their open calls, for example by tapping into venture capital communities and corporate venture activities, business angel networks, public/private accelerators and others.

Different funding approaches and criteria (see main text) resulted in substantial differences in the number of sub-grantees actually funded. The accelerator with the fewest sub-grantees was European Pioneers, with 25, and that with the most was SOUL-FI, with 130. Only two of the A16,

SOULI-FI and FINODEX had more than 100 sub-grantees. Given a total of 1047 grants issued, the average number of sub-grantees per accelerator was 65.

Figure A5.2: Number of Sub-grantees per Accelerator



Activities of Accelerators

The A16 undertook a broad range of activities. All accelerators offered some kind of mentoring and coaching, with the support of experts dedicated to the start-up teams, but the implementation approach varied. A majority of accelerators organised workshops and bootcamps, provided gateways to further funding and/or matchmaking and networking services with potential investors, and business development support. A few focused on business innovation support and six offered additional FIWARE technical support (beyond that provided by the Programme). Only one accelerator (FABulous, focused on manufacturing) offered technical support and only two provided physical spaces to the sub-grantees (CEEDTech and SOUL-FI).

Figure A5.3: Activities offered by the Accelerators

Activity	Offered by (no. of accelerators)
Mentoring, Training, Coaching	16
Business Innovation Support	4
Organization of online/offline Workshops, Bootcamps, Living Labs Spaces (including Training Voucher, Welcoming Week, Demo Day)	11
Gateways to further funding (Finance Support, Funding Services, Promoting to VCs)	11
Matchmaking and Networking	11
Business Development/ Marketing Support	12
FIWARE Technologies Support	6
Technical Support	1
Provision of physical spaces	2

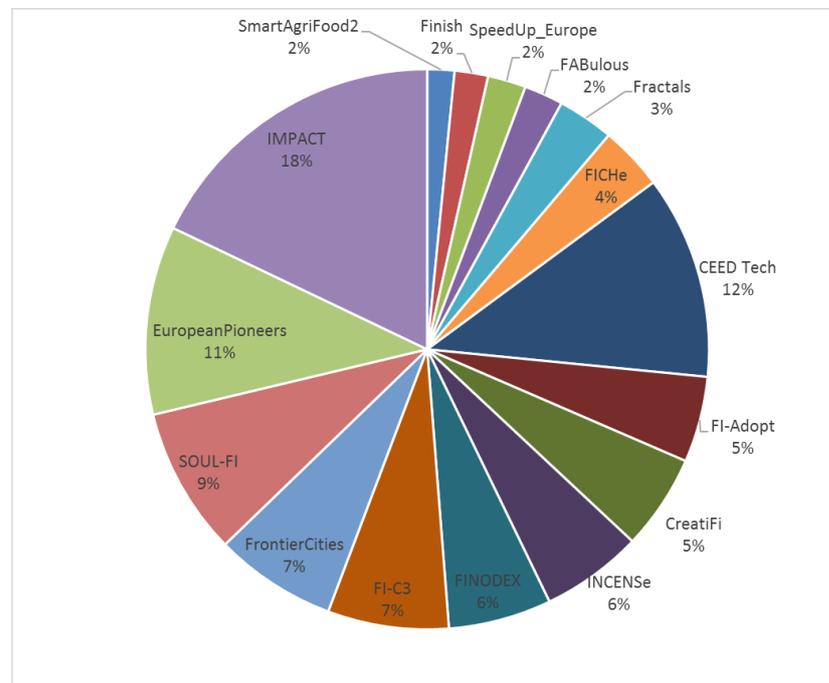
A5.2 Phase 3 Funding Applications

The 16 accelerators received in total around 8,300 applications. Of these, 1047 projects were selected and received funds during the course of FI-PPP Phase 3.

Just under half (49%) of all proposals were submitted to four accelerators: IMPACT (18%), CEEDTech (12%), European Pioneers (11%) and SOUL-FI (9%). Together, they received over 4,000 submissions:

- IMPACT received 1,491 applications in three calls, making it by far the most ‘popular’ accelerator;
- CEEDTech received 979 proposals across two calls;
- European Pioneers received 908 applications in two calls;
- SOUL-FI received 711 applications in four calls.

Figure A5.4: Submitted Proposals by Accelerator, %



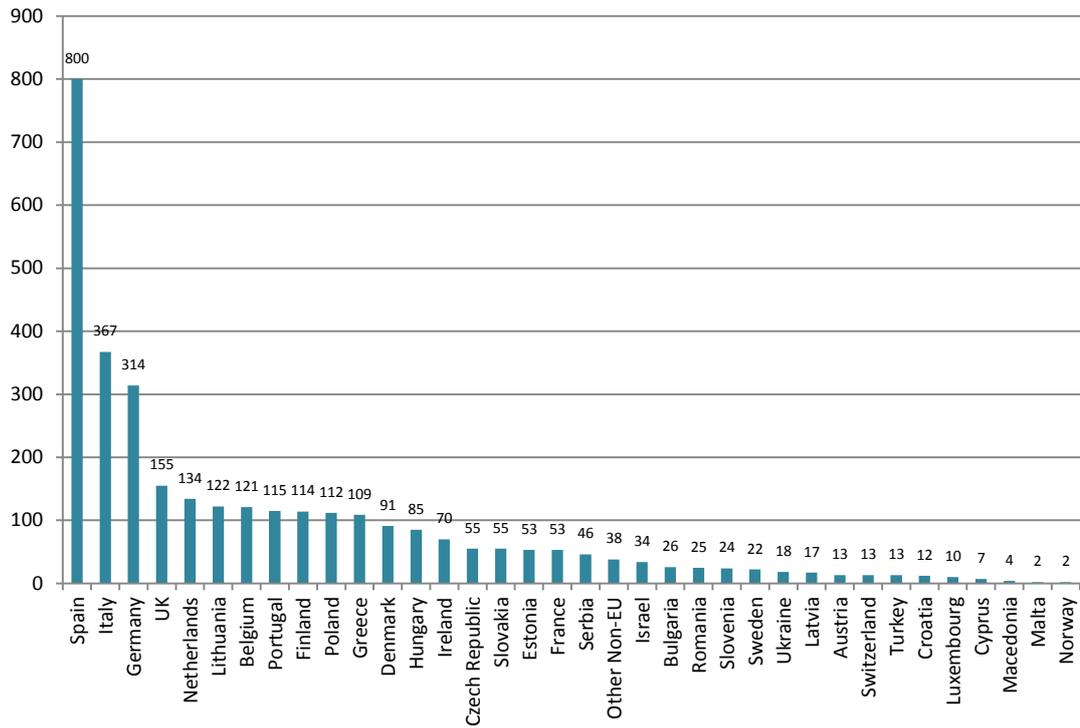
Source: FI-IMPACT June 2016, based on data provided by accelerators

On the basis of the available information, the majority of proposals were submitted by EU-based organisations (95%), but 5% of applications originated from outside the EU. Of these, 60% were generated in Serbia, Israel and Ukraine.

Three countries accounted for almost 50% of all applications:

- Spain submitted 800 projects, accounting for 25% of all applications;
- Italy submitted 367 projects, accounting for 11% of all applications;
- Germany submitted 314 projects, accounting for 10% of all applications.

Figure A5.5: Number of Applications by Country of Origin (EU and non-EU)



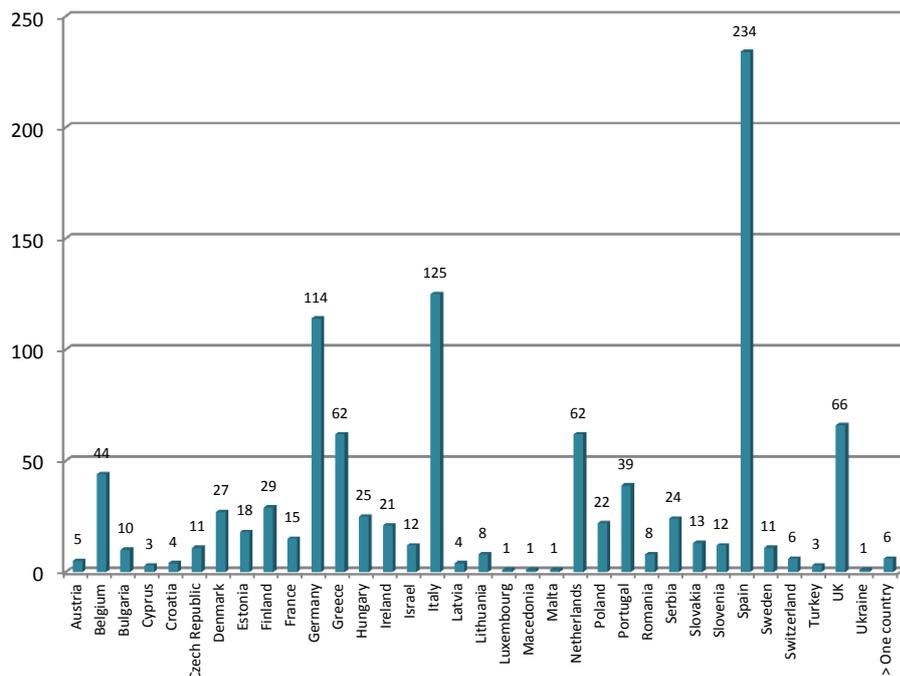
n = 3,247; submitted proposals for which FI-IMPACT received information on their country of origin.

Source: FI-IMPACT May 2016, based on data provided by accelerators

A5.3 Overview of Phase 3 Sub-grantees

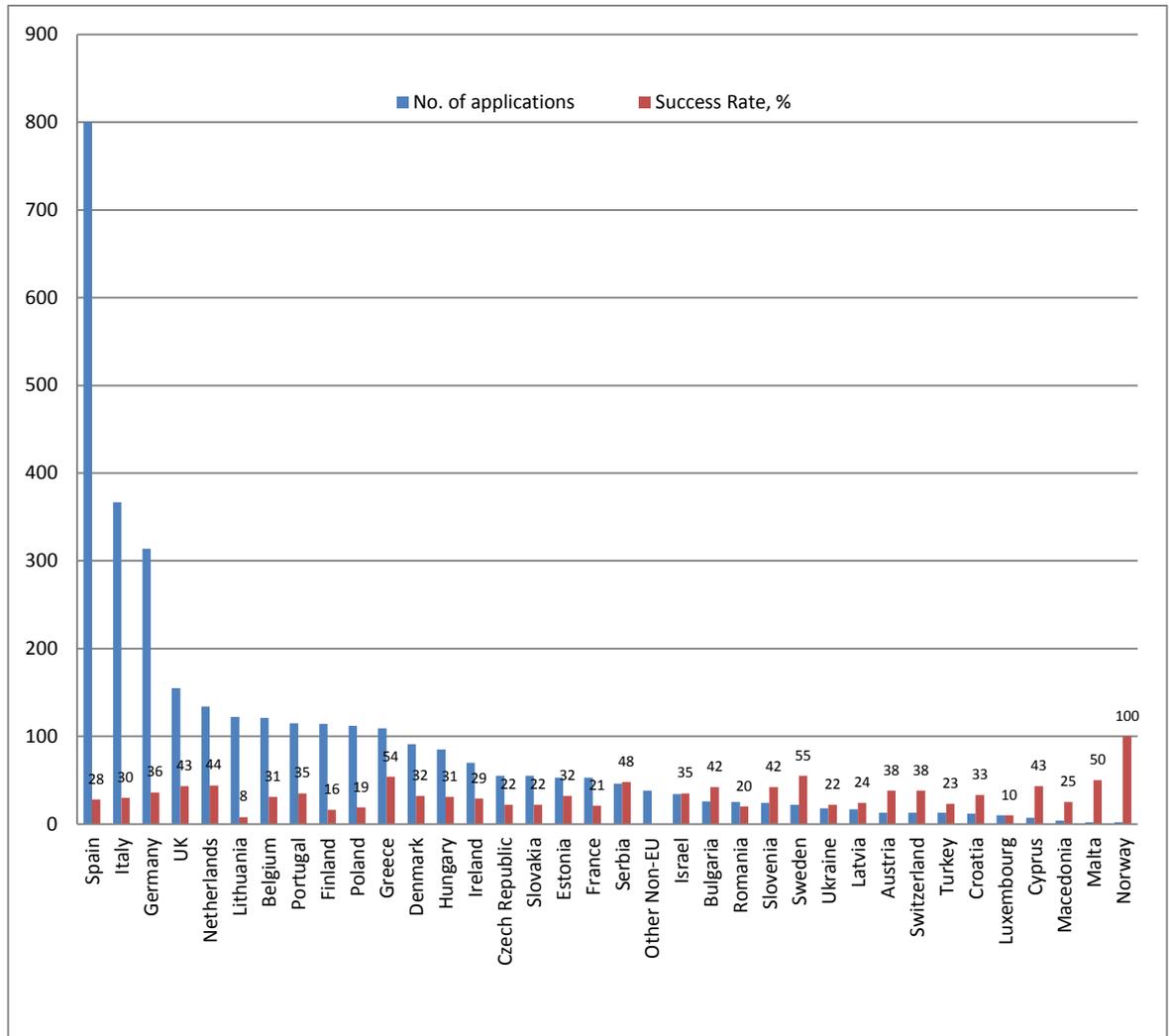
As noted above, the open calls resulted in a total of 1047 projects being funded, at least from an initial stage (under the ‘funnel approach’ some of these were subsequently eliminated).

Figure A5.6: Sub-grantees by Country of Origin



Not all countries had the same rate of success. Applications coming from Sweden (55%), Greece (54%), Serbia (48%), and the Netherlands (44%) had higher success rates compared with other countries from which at least 20 proposals originated. The analysis also found that of all countries, the Netherlands showed a good level of submitted proposals (133 submissions), as well as a high success rate in terms of number of selected initiatives (59 sub-grantees). The UK also performed well, with 66 sub-grantees from 155 submissions (43%).

Figure A5.7: FIWARE Sub-grantees as Percentage of Submitted Proposals, by Country



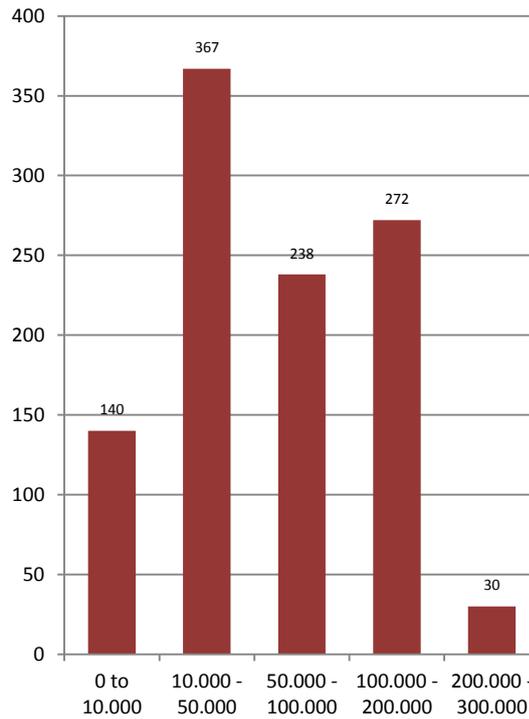
n = 985 all available sub-grantees; and n = 3,217 submitted proposals (which have received at least one sub-grantee)

Source: FI-IMPACT May 2016, based on data provided by accelerators

There was a strong correlation between the home country of the accelerator coordinator and the geographical origin of sub-grantees. This showed that communication efforts were particularly strong in countries where accelerators were based. This has benefited SOUL-FI (Spain), FINODEX (Spain), SpeedUp (Germany), CEED Tech (Hungary) and FICHe (Spain).

Around one-third of sub-grantees (367, 35%) received between €10-50k. A further 23% received between €50-100k. And another 302 sub-grantees (30%) received funding of than €100k from the FIWARE Accelerator Programme.

Figure A5.8: Number of Recipients by Amount Received



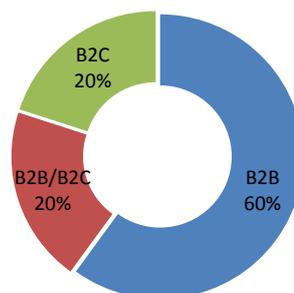
A5.4 Comparative Analysis of Phase 3 Sub-grantees

Target Markets

In terms of market focus, projects may target either the business-to-consumer market (B2C), the business-to-business market (B2B) or both (B2B/B2C). Within B2B, projects targeted one or multiple industry sectors and some offered cross-sector solutions that are appropriate for all industries.

As shown in the figure below, most of the granted proposals were developing solutions addressed to the business market. One-fifth (20%) of the funded initiatives targeted both the business and consumer markets, while 20% addressed purely the consumer market. Time series analysis by FI-IMPACT found that later initiatives (those selected from August 2015 to May 2016) were more consumer-oriented than those selected during the first calls: the B2B target market dropped by 2% during this period, while the B2C target market increased by 3%.

Figure A5.9: FIWARE Sub-grantees by Target Market

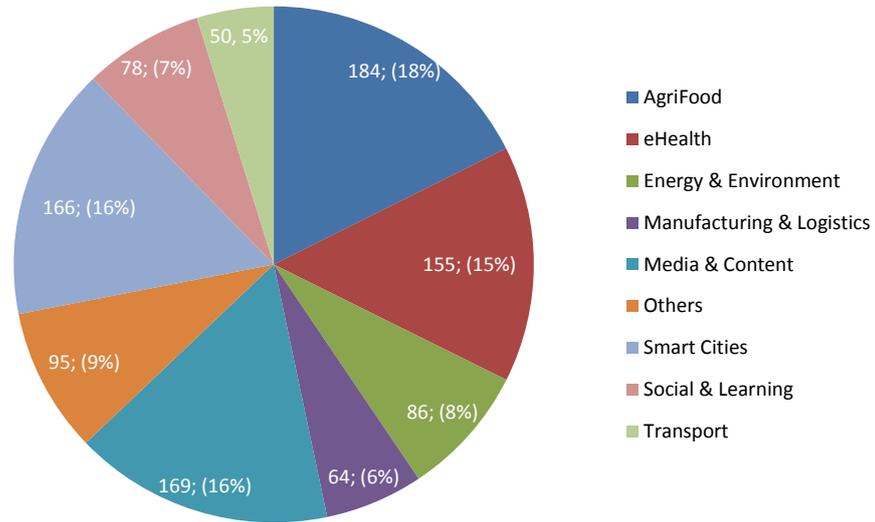


n = 985; all available sub-grantees

Source: FI-IMPACT May 2016, based on data provided by accelerators

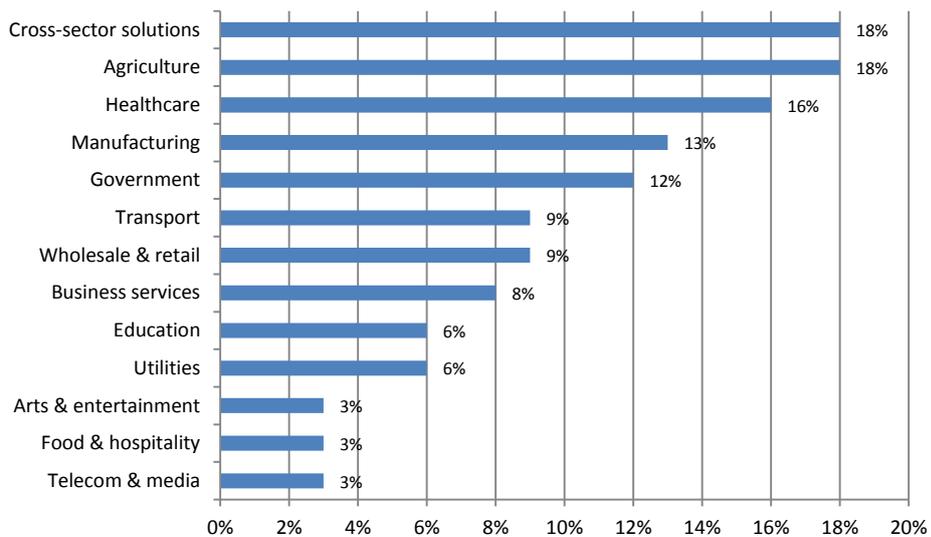
Projects covered a broad range of market sectors. Perhaps surprisingly, given that it is generally viewed as a ‘low tech’ sector, agri-food attracted the largest number of applications: three accelerators focused on this sector. Since many projects separately identified as ‘transportation’ and ‘energy’ have smart city applications, overall around 28% of initiatives were related to Smart Cities, making this the biggest single application area. eHealth and media & content were also key areas of interest.

Figure A5.10: Number of Sub-grantees by Main Sector of Activity



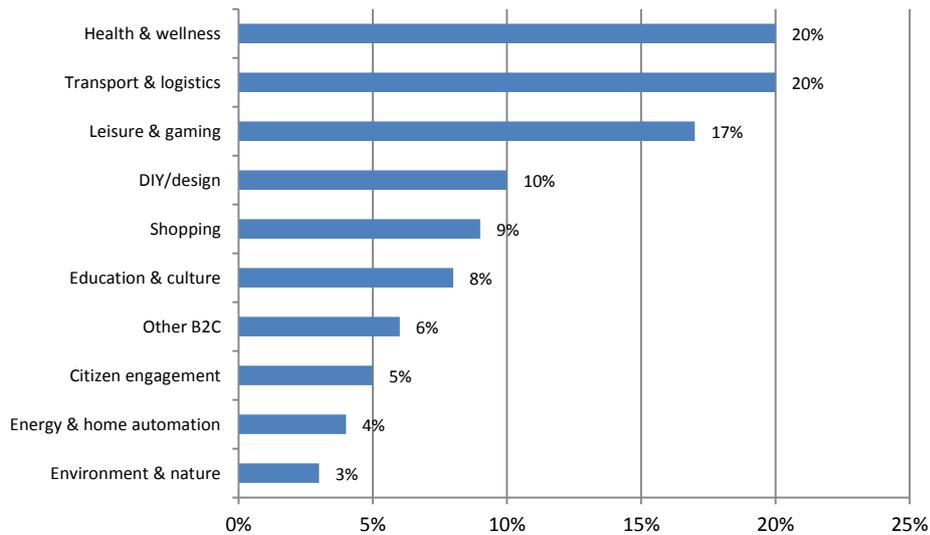
Data collected by FI-IMPACT allowed analysis across a larger number of industry sectors as well as according to the main orientations and targets within the Smart City domain (comprising transport, government, utilities and cross-sector activities). Figures A5.11 and A5.12 provide a more detailed analysis by sector. The data show that many of the start-ups and SMEs are contributing to the digital transformation of traditional sectors, such as agriculture and manufacturing, as well as improving consumers’ lives with their smart apps and services.

Figure A5.11: FIWARE Sub-grantees by Target Business Segment (B2B), %



*n = 788; all sub-grantees targeting the B2B/B2C and B2B market. Multiple answers were allowed
Source: FI-IMPACT May 2016, based on data provided by accelerators*

Figure A5.12: FIWARE Sub-grantees by Target Consumer Segment, %



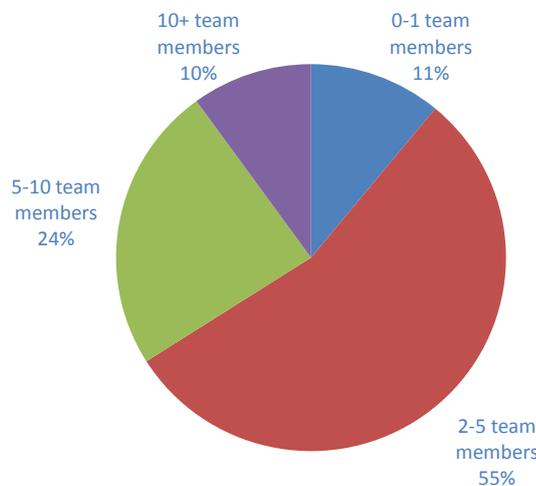
*n = 397; all sub-grantees targeting the B2B/B2C and B2C market. Multiple answers were allowed
Source: FI-IMPACT May 2016, based on data provided by accelerators*

The ICT industry is experiencing disruptive change as a result of the convergence of several key enabling technologies: mobile devices and apps, cloud services, Internet of Things, big data analytics, and social media platforms. Of projects that provided data on this aspect, 396 initiatives (40%) focused on Mobility, 326 (33%) on Big Data, 321 (33%) on Cloud, 261 (27%) on IoT, and 139 (14%) on Social Media. However, these figures do not take account of overlaps between these areas, a key focus for innovation. Many businesses are looking at these solutions to create new channels to engage with customers, to streamline processes and operations, and to innovate their products.

Team Size and Experience

The majority of funded initiatives were run by teams rather than individuals. Most of the projects (55%) involved from two to five members. Projects involving between 6 and 10 individuals also accounted for a significant share (24%) compared to those involving an individual (11%). Projects with larger size teams (exceeding ten team members) accounted for 10% of all projects.

Figure A5.11: FIWARE Sub-grantees by Team Size

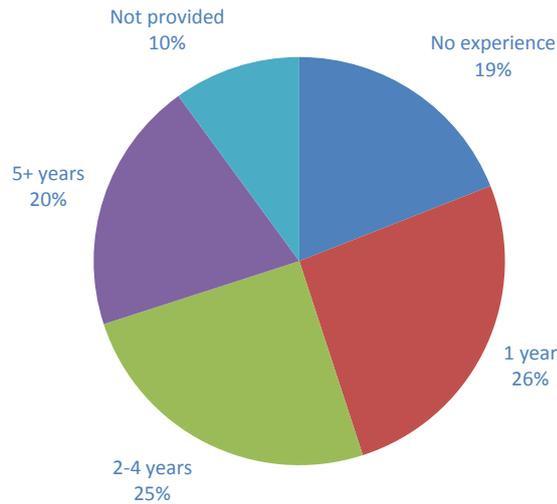


*n = 985; all available sub-grantees
Source: FI-IMPACT May 2016, based on data provided by accelerators*

Looking at the experience of sub-grantees, the majority did not have extensive experience of start-ups or running a company. In fact, 45% of sub-grantees had no previous experience or had up to one-year experience. Half of the participants (51%) had between one years' experience (26%) and two and four years' experience (25%). One-fifth of projects (20%) involved participants with at least five years' experience.

Less numerous were projects driven by participants without any experience at all (19%), meaning that in this phase participants with at least some expertise and knowledge were considered by the accelerators to be most likely to run successful projects compared with brand new entrepreneurs.

Figure A5.12: FIWARE Sub-grantees by Team Experience, %



n = 985; all available sub-grantees

Source: FI-IMPACT May 2016, based on data provided by accelerators

Taking the experience and team size data together, around one third (36%) of projects with inexperienced participants were from a company or project with just one employee. This percentage dropped to 12% for projects whose participants had at least one years' experience. For larger teams, 35% of those with members having two to four years' experience were in projects with six to ten team members, while among members with more than ten years of experience more than half were in teams larger than ten employees.

This behaviour shows that experienced teams understand the importance of working in bigger teams with the necessary capacity to share knowledge, skills, and networks to strengthen their business models.

ANNEX 6: RECOMMENDATIONS OF FI-PPP INTERIM ASSESSMENTS

Recommendations of First Interim Assessment, May 2012

No.	Summary of recommendation	Time-frame
Recommendations for the Commission concerning PPPs in Horizon 2020		
1	Establish guidance on governance of PPPs	WP2014
2	Ensure that each PPP has an effective central governing body	WP2014
3	PPPs should be able to use the widest range of innovation-oriented instruments in a coordinated manner.	WP2014
4	Re-design the process of calls for and selection of proposals to focus on achieving greater 'impact'.	WP2014
5	Participants in projects within programmes must collaborate fully so as to achieve programme objectives.	WP2014
Recommendations for present and future partners in the FI-PPP		
6	Industrial participants should fulfil the role expected of them in a PPP.	Now
7	The chairman of the Steering Board should be a senior executive of a company that is not a co-ordinator of any FI-PPP project.	June 2012
8	The Advisory Board should focus their advice on bringing the results of the FI-PPP to market.	Now and continuing
9	The programme should engage more energetically - and more visibly - with the wider community of both users and technology providers	Now and continuing
Recommendations for the European Commission concerning the present programme		
10	Calls for tender should be considered for future 'horizontal' actions	Now
11	Future calls should emphasize the importance of take-up	Now
12	Future calls should explicitly seek the engagement of representatives of the broad community - industrial associations, public-sector associations, consumer associations, etc, and, where appropriate, regulators.	Now and continuing
13	Engage the innovative SME community better.	Now
14	Make greater effort to achieve co-ordinated, co-operative behaviour of participants to achieve programme objectives.	Now

Recommendations of Second Interim Assessment, March 2014

No.	Summary of Recommendation	Responsible
Building a Trusted FIWARE Landscape		
1	Accelerate the planning of sustainability initiatives	Steering Board
2	Streamline governance to meet the needs of the post-programme landscape	Steering Board; Executive Industry Board
Nurturing the FIWARE Ecosystem		
3	Continue to support and strengthen the network of FIWARE accelerators	Accelerators; European Commission
4	Broaden and deepen the engagement with industry	Executive Industry Board; European Commission
5	Strengthen engagement with the investor community	Steering Board; Accelerators; Press Office
Strengthening Market Confidence in FIWARE		
6	Sharpen the business focus within the FIWARE ecosystem	Steering Board; FI-CORE; Press Office; Industry partners

7	Intensify communications and outreach efforts around market take-up	Press Office and other FI-PPP Partners
Promoting Take-up of FIWARE-based Solutions		
8	Engage lead users and entrepreneurs	Accelerators and other FI-PPP Partners; European Commission
9	Improve alignment with European programmes and policies	Industry participants and other FI-PPP Partners; European Commission
10	Promote FIWARE in innovation procurement	European Commission
Sharing the FI-PPP Experience		
11	Establish a FIWARE Observatory to undertake long-term monitoring of results and impacts	European Commission; FIWARE Foundation
12	Capture and disseminate knowledge for policy learning	European Commission

ANNEX 7: EVIDENCE BASE AND INTERVIEWEES

During the course of the evaluation the Expert Panel:

- reviewed web-based and documentary evidence;
- conducted interviews with a range of stakeholders;
- consulted directly with a number of external experts;
- analysed statistics (with the help of the Commission).

The principal website, with information on all aspects of FIWARE activity, is: www.fiware.org. Substantial information on the execution of the Accelerator Programme is available at the website of the FI-IMPACT PSA, www.fi-impact.eu.

Input Documents

The Panel reviewed a wide range of documentation, of which some was provided by the Commission and/or FI-PPP projects and some was sourced by the Panel directly. The main categories of documentation were:

- Reports of the First and Second Interim Assessments of the Future Internet Public-Private Partnership, published in May 2012 and March 2014 respectively.
- Review reports compiled by independent experts for projects launched under Phase 3 (the sixteen Accelerators).
- Review reports compiled by independent experts covering the technical quality of FIWARE enablers and other technical issues.
- Data on the performance and execution of the FIWARE Accelerator programme, generated by three of the Phase 3 Programme Support Actions (FI-IMPACT, FI-Business and FI-LINKS).
- Supplementary data and information provided by interviews and consultees in response to the Panel's inquiries (see list below)
- General documents on the FI-PPP, such as the legal basis for FP7; FP7 rules for participation; and the ICT Work Programme 2011-13.

Interviewees and Consultees

Ulrich Ahle	chief executive officer, FIWARE Foundation
Ragnar Bergström	European Commission
Karen Boers	reviewer of FIWARE accelerator projects
Grigoris Chatzikostas	project manager, FRACTALS accelerator
Peter Fatelnig	European Commission
Garan Goodman	chief marketing officer, FIWARE Foundation
Juanjo Hierro	CTO, FIWARE Foundation
Pablo Honrubia	head of FIWARE Press Office
Sanyu Karani	representative of Impact & Impact Growth accelerators
Ilkka Lakaniemi	programme chair, FI-PPP Programme
Oscar Lazaro	representative, FITMAN and Fabulous
Christian Lüdtkke	coordinator, European Pioneers accelerator
Antonello Monti	representative, FINESCE project
Luis Muñoz	professor, University of Cantabria
Rosalía Simon Navarro	board member, FIWARE Foundation
Richard Stevens	project manager, FI-IMPACT project
Harald Sundmaeker	FISPACE & SmartAgrifood 2 projects
Federico Travella	A16 Monitoring Group; co-leader of the VIP Programme



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